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ABSTRACT

The purpose of the Model Academic Curriculum Project was to assess and define the most effective components of the curriculum for Massachusetts vocational-technical schools that would be reflective of current academic demands and employment needs. Eight study goals were implemented: establish statewide meetings; identify/select study groups; develop academic reports--math, science, English/communication, social studies; hold group planning meetings; design a statewide assessment survey; coordinate statewide curriculum development projects/services; plan conference presentations; and develop a final report. A collaborative planning/implementation model monitored and evaluated study components. The project sought to improve school performance by aligning academic and vocational curriculum elements. Effective strategies and instructional resources were designed to make information available to teachers. Curriculum changes focused on differences in learning. Participant conference/workshops promoted student learning motivation, effective instructional programs, and academic application within a coordinated and articulation style context. (This document contains eight appendices providing: names of the project advisory committee; a participant list; project research agendas; sample academic program review instruments; information about statewide curriculum projects; the survey instrument with instructions and definitions; a graduate course syllabus; and an information sheet showing how earlier educational reform reports defined high school graduation requirements.) (NLA)

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ED349409

A Model Academic Curriculum for the Massachusetts Secondary Technical Vocational Setting

A Project Funded by:
The Bureau of Program Services,
Division of Occupational Education,
Massachusetts Department of Education

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For those whose contributions, skills, patience and support made the compilation of this report possible, recognition of their assistance is little compensation but a gratifying experience. Although the findings, recommendations and definitional parameters of any curriculum design venture represent the beginning of a process rather than an end to one, this report is an indication of the level of cooperation which characterizes the spirit of those who labor within the vocational technical schools of the Commonwealth of Massachusetts. The project recognizes the help of the following:

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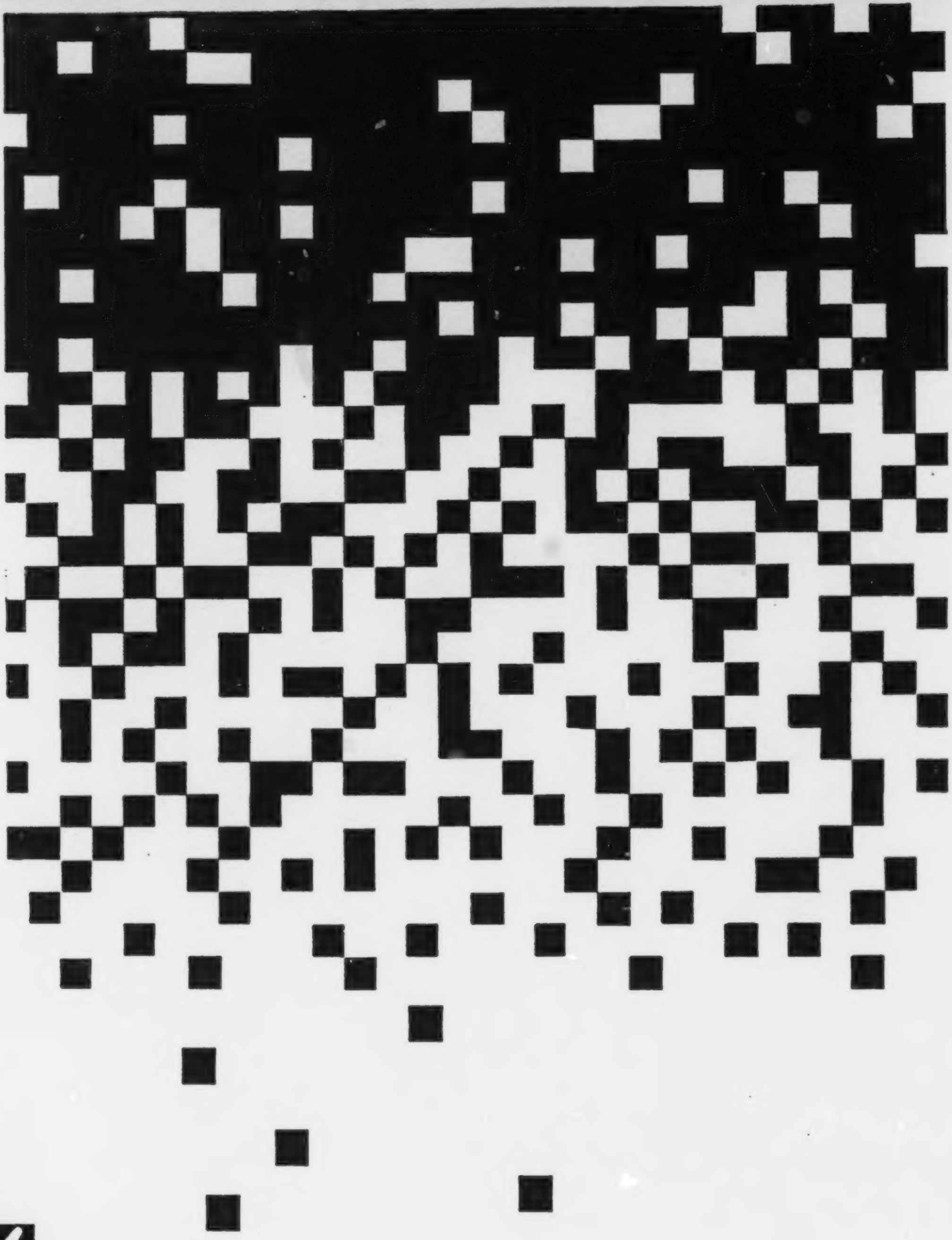


Introduction

I. INTRODUCTION

The ideas, literature extractions, curricular content characteristics and methodological approaches put forth in this document represent the thoughts and recommendations of the more than two hundred practitioners who contributed during the project. The viewpoints expressed should not be considered products of consensus or a single plan of action for the design of a model academic curriculum for secondary vocational technical schools. The design and reform proposals contain an abundant supply of "shoulds" and "oughts" to achieve the desired delivery system.

Project participants extend major appreciation to Dr. Elaine Cadigan of the Massachusetts Division of Occupational Education for her leadership role throughout the project. The project's concept and design are directly attributable to this incomparable leader. It was her labors which enabled academic representatives from vocational technical schools to meet, voice and shape project findings in partnership with their vocational technical colleagues.

Although it is challenging to offer a summarized version of the recommendations of all those who extended input in the components of this final report, some conclusions are appropriate. Many vocational technical educators favored a mandated statewide academic program which specifies at least minimum standards for high school graduation. The report which follows was designed with adherence to the following (RFP) request for proposal requirements and it is consistent with the project activities originally put forth in the proposal submitted by the staff of Westfield State College. The final report represents model and not mandated characteristics. Participant feedback, however, continually argued for more stringent academic requirements in an effort to strengthen the credibility and diploma credentialing of Massachusetts vocational technical high school graduates.

Group members also favored an eight period day for addressing traditional academic scheduling with academic courses or other learning opportunities of a duration which run for less than a full year. Semester length or other short term time blocks were deemed more flexible, less failure producing, and more diversified than fixed full year "courses". Project discussion advocated the eventual design of a personalized secondary learning approach which would recognize entry competence levels of individual students and permit each candidate to advance without adherence to fixed time schedules. Standard and prescribed academic courses with their corresponding time units, grade levels, and other classifications were viewed as administrative convenience and as unaccommodating and even insensitive to individual learning needs. Activities which promote entrepreneurship, healthy competition, employment survival skills, real world application, microcomputer literacy and supportive of the team concept were highly recommended.

Required project activities included:

(1) The design, development and dissemination of project resources which are sensitive to the recruitment, retention and placement of nontraditional students and target populations within quality vocational technical programs.

(2) The identification, collection, analysis, summarization and reporting of the current academic support programs in existence within the Massachusetts secondary vocational technical delivery system.

(3) The exchange of findings and regular collaboration effort with the staffs of the Division's Model Competency-Based Technical Assistance Project, Model Math/Science Competency-Based Project, Model Communications Project and the Massachusetts Vocational Curriculum Resource Center.

(4) The development of the parameters of a model academic curriculum for vocational technical schools which sanctions precise curricular and creative methodological changes and which allows for an effective blending of locally identified academic and technical skills and concepts.

(5) The offering of two major statewide conferences and several mini regional workshops, a presentation and display of the draft report during a May, 1989 telecommunications conference and presentations at the June, 1989 Professional Development Conference in an effort to expand data collection and to enable resources which provided the project participants to conduct subsequent LEA based informational orientation sessions with colleagues.

(6) Findings based on recent practice and research conducted within the United States.

(7) An advisory group approved by the Director of the Bureau of Program Services which included academic and vocational technical instructors, administrators, teacher trainers and representatives of target populations.

(8) Active networking with professional organizations via affiliation with statewide vocational technical associations.

Project contributors supported textbook authors of diverse ethnic and racial backgrounds with an integrated rather than isolated curriculum approach to issues of race, gender and class. Topical selections and issues which address African Americans, women, Asians, Pacific Islanders, Hispanic, Latino, the handicapped and other minority groups were encouraged as truly representative of the work force population.

The participant input collected via the project's two major statewide conferences (Greater Lowell Regional Vocational Technical High School and Blackstone Valley Regional Vocational Technical High School), the regional forums (Westfield State College and Somerville High School, Assabet Regional Vocational Technical High School, Springfield [Putnam Vocational High School], Westfield Vocational High School, Nashoba Valley Regional Vocational High School, Worcester [Fanning Vocational High School]), the Massachusetts Curriculum Resource Center Telecommunications Conference, and the professional organization network (Massachusetts Association of Vocational Administrators, Massachusetts Vocational Association) gave credence to school-based curricular developed by practicing teachers and administrators. Project developed teacher endorsed learning activities which require students to think critically, recognize propaganda and expose bias, rationalize, seek solutions, develop flexible thinking patterns, analyze problems, be imaginative, and develop intellectual capabilities through lifelong educational experiences.

Project affiliates sanctioned learning which enables students to participate in active interaction with the working community, mini internships, and participation within vocational technical student organizations [Vocational Industrial Clubs of America (VICA), Distributive Education Clubs of America (DECA), Future Farmers of America (FFA)]. Strong support was garnered for strategies which maximize opportunities for students to comprehend, anticipate and cope with change and diversity and to develop skills to utilize these factors to their advantage.

Project discussion recognized that occupations requiring few basic academic skills are rapidly disappearing while new ones demanding reading and computational skills sophisticated enough to use in everyday problem solving are being created. Vocational technical graduates must therefore improve their total skills if they are to reach their individual potential in the workplace. Students must be given the opportunity to acquire an understanding of the technical application of the math, science, and communications essential to their given trade area. Unfortunately, most high school students fail to see any significant use or applicability of academic skills such as mathematics in their lives.

The Educational Testing Services of Lawrence Township, New Jersey regularly examines secondary school effectiveness and periodically issues "The Nation's Report Card: Are We Measuring Up?" The May 1988 report rated the average high school student's overall basic mathematic capabilities as "dismal". The report indicates that a major weakness rests in our ability to assist students to recognize the importance of math in their lives. Studies conducted by staff of the Massachusetts Department of Education, during 1988, also support this need to re-examine and refocus the high school curriculum. Research intended to determine the reasons why one of out five students who entered the ninth grade in Massachusetts during 1986 was a likely dropout identified several contributing factors to this dilemma. The research stated: "The Massachusetts dropout study is only one dimension in a complex of school problems which include inadequate funding, demoralized teachers, deteriorating school buildings and high school graduates who cannot read, write or compute well enough to qualify for a job."

The 1988 report by the Carnegie Foundation for the Advancement Teaching notes the enthusiastic response to the call for language proficiency as cited within previous Carnegie reports. With recognition that the chief instrument for conveying ideas and expressing reactions to the ideas of others is rooted in language skills, the 1983 Carnegie report stated that all students should be taught to think with power and precision. Earlier reports (Please examine the recommendations contained within Section III) asked the nation's schools to give priority to language in the written and spoken word. Across the nation, the number of English and literature credits required for graduation has increased; writing across the curriculum has become a widely endorsed concept and the literacy movement has earned crusade level support. Technology has accelerated dramatically the need for employees who can communicate quickly, clearly and effectively.

Frank R. O'Keefe, Jr., Chief Executive Officer and Chairman of the Board of the New Haven, Connecticut based Armtek Corporation, stated that "we must prepare the next generation of business and industry people to be more responsive and flexible and to challenge each employment candidate's capacity to continue learning, exploring, creating and growing". O'Keefe believes the ability to learn "how to learn" is what gives a person the superior flexibility, resilience and the perspective to guide his or her course in an industrial and technical world which accelerates at baffling speed (October 1988 speech at Amherst, MA).

The Massachusetts vocational technical educators involved within the project acknowledged that it is not uncommon for colleagues outside of the vocational technical community to view secondary learning as a means of acquiring and storing answers to problems which have already been solved. But the process of learning "how to learn" means responding successfully and creatively to unprogrammed real life experiences; developing new solutions, new responses to new issues and problems.

No matter what the employment specialty may be, today the individuals who are able to write with confidence and skill have far more opportunity to be useful and successful than those who do not possess such talents. While encouragement is extended by teachers who report that overall language and computational achievement levels of their students have recently improved, articles such as Best of Business Quarterly's "Crisis in the Schools" (Winter 1988) indicates that since 1985 one-third of the hourly workers at Polaroid Corporation needed to complete classes in reading, writing and problem solving. Motorola, Incorporated, which has traditionally interviewed eight to ten applicants for entry level positions, currently screens as many as fifteen just to hire one — while it is only seeking seventh grade English skills and ninth grade math skills.

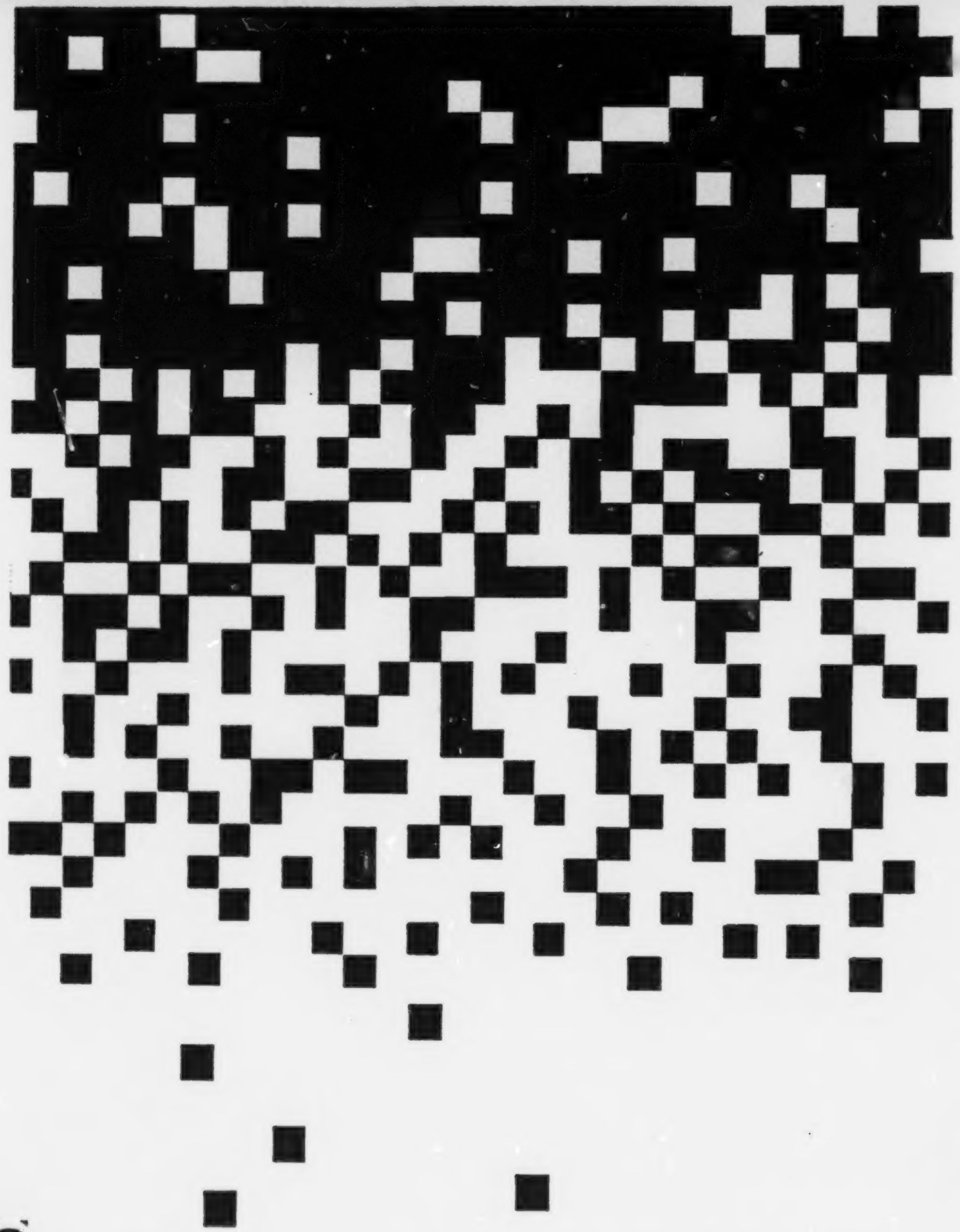
J. D. McNeil suggests four alternative organizational configurations for enriching student learning activities. The common core of McNeil's model is found in his goal to expand students' opportunities for strengthening understanding and discovery across disciplines. His concept provides excellent support for the benefits of blending academic and vocational technical learning. This proactive process of seizing every opportunity for continuous academic instruction became a frequent recommendation of the participants of the Model Academic Project. McNeil's patterns are put forth in a 1985 publication - Curriculum: "A Comprehensive Introduction" and are summarized as follows:

1. **Unified or Concentrated** — Major themes serve to organize the subject matter from various disciplines. The concept of energy, for example, can be studied from biological, physical, chemical, and geologic perspectives.

2. **Integrated** — Skills learned in one subject area are used as tools in another field. Mathematics, for instance, is taught for the solving of scientific problems.

3. **Correlated** — Disciplines retain their science identities, but students learn how concepts in one discipline are related to those in another. For example, history, geography, and English may be taught so as to reinforce one another.

(continued on page 6)



Project Methodology

4. **Comprehensive Problem Solving** — Problems may be drawn from current social interests such as consumer research, recreation, and transportation. Students must draw on skills and knowledge from the sciences, social sciences, mathematics, and art in the attempt to optimize a solution.

Additional support for McNeil's premise is found in Joel M. Levine's 1989 book entitled: Secondary Instruction — A Manual for Classroom Teaching. Levine argues that:

> Successfully integrating the knowledge of different disciplines to enrich students' learning in a particular course requires considerable skill and confidence. There are, however, no shortcuts to gaining such skills and confidence. It requires consistent and thoughtful effort to gain the level of understanding of a subject needed to effectively integrate material of several disciplines in a form that addresses students' learning needs. An unquenchable interest in learning, one of the teacher's greatest assets, is the basis for successfully making such an effort.

The statewide conference input by Model Academic Project participants offered support for the philosophy promoted within the works of Steven Benjamin, Coordinator of Curriculum and Instruction for the Metropolitan School District of Decatur Township (Indianapolis, Indiana). Benjamin (Educational Leadership, September 1989) states "The future will arrive ahead of schedule. By considering (educational) futurists' recommendations for change, perhaps we can restructure education before it is too late. With proper future-oriented pedagogical, curricular and organizational changes, we can help students meet the challenges of new ages."

The contributors to this project hope its activities, data collection, deliberations, survey results and final report recommendations and considerations provide a solid step forward in the development of a model academic program for vocational technical education within Massachusetts.

II. PROJECT METHODOLOGY

The overall purpose of the Model Academic Curriculum Project was to assess and define the most effective components of the model academic curriculum for vocational technical schools which reflect the academic demands and employment needs of a diversified, highly sophisticated technological society. Early on in the implementation of the project, an advisory board was established (see Appendix A).

The activities, deliberations and findings of the project were completed at a time when the United States Secretary of Education, Lauro Covazos, released the results of nationwide studies on the reading and writing performance of 9, 13 and 17-year olds. The Nation's Report Card, a 1988 study conducted by the Federally funded National Assessment of Educational Progress (NAED), found that the overall reading and writing performance of students examined remained virtually unchanged since NAEP's last assessment completed during 1984.

The National Education Association said the findings "offer national education goal setters some important food for thought". The Educational Testing Service said the results warrant attention from all policy leaders, educators, and parents.

National Assessment or NAEP uses five levels of reading, proficiency to define students' reading skills and strategies: rudimentary, basic, intermediate, adept and advanced. Key findings in the reading report were:

◊ Since 1980, the percentage of 9-year olds with basic reading skills - the ability to understand specific or sequentially related information - has declined from 68 to 63 percent. Seven percent lack rudimentary skills required to carry out simple reading tasks.

◊ Forty-two percent of all 13-year olds lack the skills needed to read at the next highest level which calls for the ability to interrelate ideas and make generalizations. Although black 13-year olds have made steady improvements in acquiring these skills, 61 percent are still unable to read at the intermediate level.

◊ The percentage of 17-year olds reading at the intermediate level has increased steadily - from 81% in 1980 to 86% in 1988.

◊ Nearly 6 out of 10 - 58% - of 17-year olds cannot read at the adept level, which is defined as the ability to find, understand, summarize and explain relatively complicated information.

◊ Less than 5% of the nation's 17-year olds are reading at the advanced level, which includes skills needed to understand scientific materials, literary essays, historical documents, and materials generally found in professional and technical work environments. In 1971, nearly 7% were reading at the advanced level.

"The overall picture suggests a nation of students who were reading better than their counterparts did in 1971, but it must be emphasized that the progress is slight and could be short-lived", the report said.

Two reports on reading and writing followed the release of the June, 1988 NAEP report, The Mathematics Report Card - Are We Measuring UP?, and the September, 1988 Science Report Card - Elements of Risk and Recovery. The advisory board (See Appendix A) of the Model Academic Project found the information within the NAEP reports to be ample cause for a renewed determination to take action. Advisory board members felt that leaders of every level are struggling with ways to improve the quality of education so that today's children will be equipped to be tomorrow's leaders and workers, tomorrow's educators and scientists and tomorrow's parents and business people. Advisory board participants agreed that while education is a national concern, most solutions will be identified locally.

Based upon extractions from the literature and the discussion and comments of the advisory group members, the following goals for the project were established:

1. Conduct a statewide assessment of the academic curriculum in the vocational technical setting.

2. Revitalize the academic curriculum within vocational technical schools by providing recommendations and a framework for curriculum components which directly meet the needs of today's vocational technical students.

3. Design curriculum components which include innovative methodological strategies for more effective integration of academic and technical concepts.

4. Strengthen the participation and success of all students in the academic programs within vocational technical education—especially at-risk students and non-traditional students.

5. Establish a system of curriculum assessment, curriculum development, and instructional management for the improved delivery of the academic curriculum in a vocational setting.

Based upon the aforementioned goals, the Massachusetts Department of Education, Division of Occupational Education, stated that the Department of Education is concerned that as the definition of learner competencies extends beyond the knowledge of simple skill levels, the matter of academic and technical curriculum delivery is becoming increasingly complex. As a result, it will demand more articulation and alignment of the academic and technical curriculum. Therefore, the challenge, as outlined by the Department of Education's Request for Proposals, is to design and develop a model academic curriculum that meets the demands of competency-based vocational technical education curriculum and establish strategies for integrating such a delivery system with vocational/academic instruction.

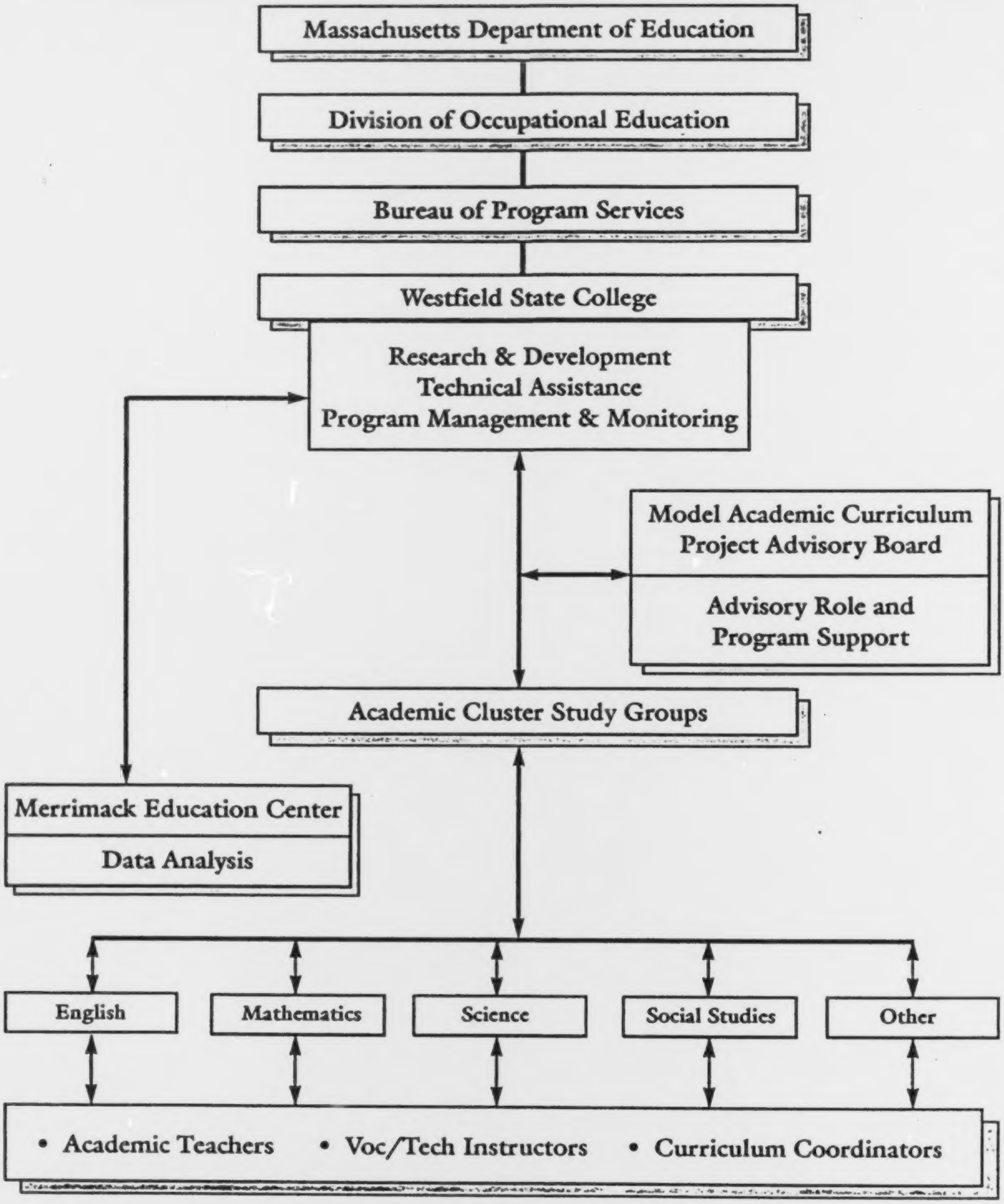
In order to meet the aforementioned goals, strategy and challenges, the following study components were identified:

1. Statewide orientation meetings
2. Identification/selection of academic cluster study groups
3. Academic study reports — math, science, English/communication, social studies
4. Small group regional planning meetings
5. Statewide assessment survey of academic curriculum
6. Awareness of other statewide curriculum development projects and services
7. Presentations at annual professional development conference
8. Publication of final report — findings and recommendations.

In order to properly implement, monitor and evaluate the study components, a collaborative planning and implementation model was developed. Please see Figure 1 on the next page.

Figure 1

COLLABORATIVE PLANNING AND IMPLEMENTATION MODEL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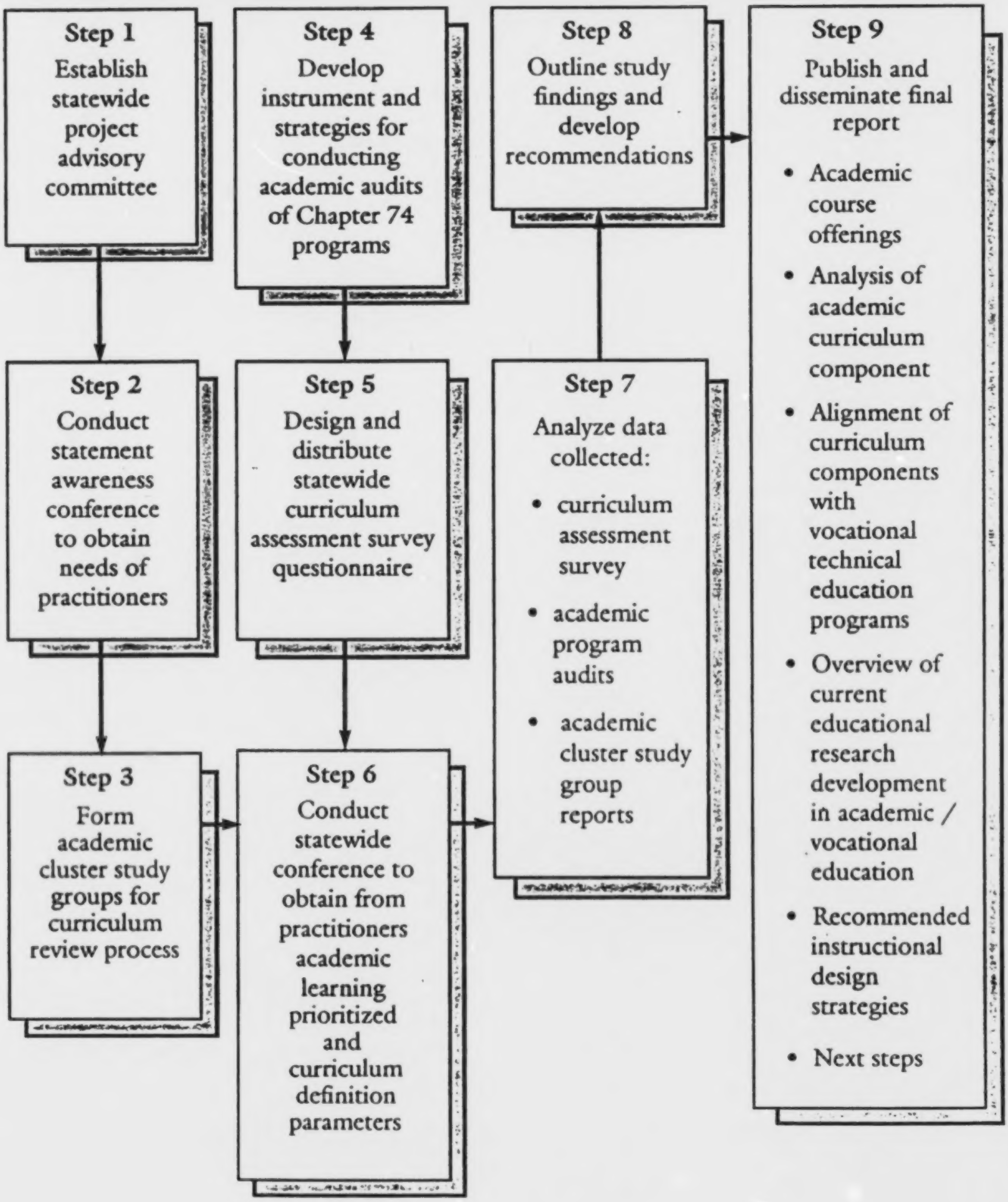
Advisory Role and Program Support
Academic Cluster Study Groups
Merrimack Education Center
Data Analysis
English
Mathematics
Science
Social Studies
Other
• Academic Teachers
• Voc/Tech Instructors
• Curriculum Coordinators

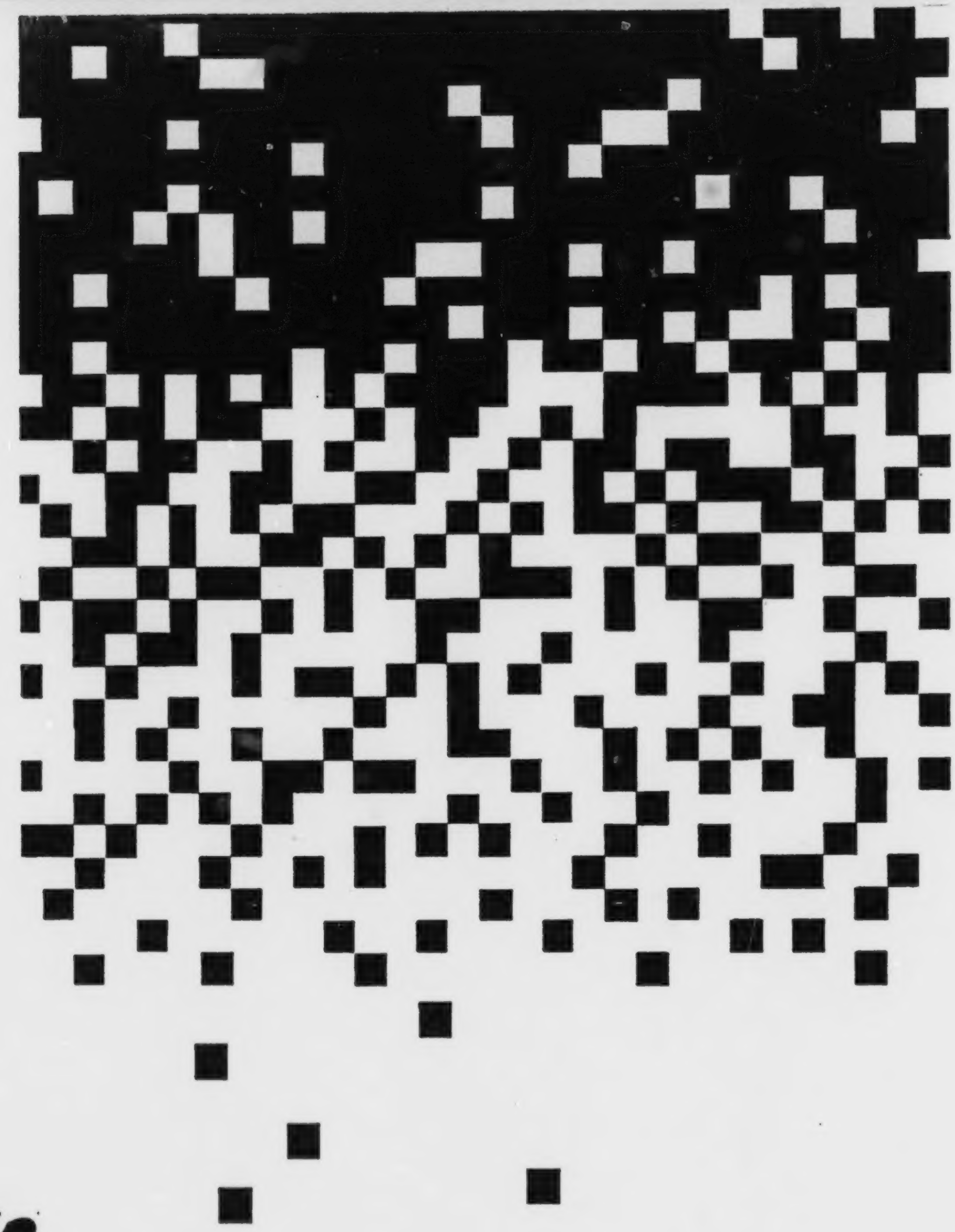
Figure 1 provides a detailed description of the collaborative planning implementation model for this project. The subsequent sections of this study and its final product are designed to identify new processes for improving school performance by ensuring that all elements of a school's academic curriculum (its assessments, learning tasks, remedial programs and instructional materials) are all carefully aligned with appropriate vocational technical competencies. Strategies and instructional resources have been identified in this report which provide for more effective instruction by making more pertinent student-centered curriculum information available to the teacher. Many of the recommended curriculum changes outlined by the participants involved in the study facilitate the implementation of an instructional delivery system that focuses on differences in learning — not in learners. In addition, the participant conference and workshop input activities continually focused on the need to promote increased motivation of students for learning, effectiveness of instructional programs, and application of academics within a coordinated and articulation style context. Lastly and most importantly, the project methodology employed provided opportunities to expand and improve communication between academic and vocational technical instructors (curriculum articulation).

A content and progression of the project activities for the assessment and design of a model academic curriculum project are clearly outlined in Figure 2 and a detail listing of project participants and detailed agendas for each of the project research activities as outlined are contained in Appendix B and C of this study.

Figure 2

ASSESSMENT AND DESIGN OF A MODEL ACADEMIC CURRICULUM PROJECT


Step 1
Establish statewide project advisory committee
Step 2
Conduct statement awareness conference to obtain needs of practitioners
Step 3
Form academic cluster study groups for curriculum review process
Step 4
Develop instrument and strategies for conducting academic audits of Chapter 74 programs
Step 5
Design and distribute statewide curriculum assessment survey questionnaire
Step 6
Conduct statewide conference to obtain from practitioners academic learning prioritized and curriculum definition parameters
Step 7
Analyze data collected:
• curriculum assessment survey
• academic program audits
• academic cluster study group reports
Step 8
Outline study findings and develop recommendations
Step 9
Publish and disseminate final report
• Academic course offerings
• Analysis of academic curriculum component
• Alignment of curriculum components with vocational technical education programs
• Overview of current educational research development in academic / vocational education
• Recommended instructional design strategies
• Next steps



Review of National Education Reports

III. REVIEW OF NATIONAL EDUCATION REPORTS

A flood of national education reform reports have encouraged citizens to design more effective schools and to establish the necessary support to insure quality secondary education. As required within the request for proposal obligations, the Model Academic Project examined several of these reports to become more familiar with their strategies and recommendations for strengthening educational programs, academic course and non-course offerings.

Considerable time has elapsed since staff members at Harvard University published their 1945 report, General Education in a Free Society, and yet the two primary educational goals of this study: "to help young persons fulfill the unique, particular functions in life which it is in them to fulfill and fit them so far as it can for those common spheres which, as citizens and heirs of a joint culture, they will share with others", are still relevant. An outline of the findings of this much discussed report and those proposed within the 1918 Cardinal Principles and the James B. Conant's 1959 American High School Today are located in Appendix H.

The accompanying section highlights the priority topical concerns identified within the national reports which were reviewed. Each of the outline subsections analyze the major curriculum recommendations and graduation requirements as they relate to contemporary education issues and school improvement strategies. The information contained in this section of the report is intended to be used for review and comparative purposes only. The information should be taken as a broad overview of major themes and as a starting point to guide you through the various individual reports. The material is not presented as a definitive summary of all of the information touched on within the reports, but it may well provide a lens for examining the definitional parameters put forth in the Model Academic Project findings. The following is a listing of the national education reports that have been reviewed in this section of the report.

MAJOR RECOMMENDATIONS OF EDUCATIONAL EXCELLENCE REPORTS

1982 Iowa Secondary School Principals
1982 Paideia Proposal by Mortimer J. Adler
1983 ASCD 17 School Network Recommendations
1983 National Commission on Excellence - *Nation at Risk*
1983 Ernest Boyer - *Report in Secondary Education*
1983 Task Force on Education - *Action for Excellence*
1983 National Science Board Commission
1984 National Commission on Secondary Vocational Education - *The Unfinished Agenda*
1984 High Tech Schools - *The Principal's Perspective*
1986 New York - *New Directions for Secondary Vocational Education*
1989 Restructuring Secondary Vocational Education - *A Report by Staff of Wisconsin Department of Public Instruction and The University of Wisconsin-Whitewater*
1990 Massachusetts Model Academic Project for Secondary Vocational Technical High Schools

MAJOR RECOMMENDATIONS OF EDUCATIONAL EXCELLENCE REPORTS

		Strengthen Requirements Mathematics	Science	English/Communications	Social Studies	Other Academics	Computer Literacy	Establish Curriculum Core/Standard	Emphasize Critical Thinking and Reasoning Skills	Eliminate Tracking	Utilize Existing Time Better	Equity/Civil Rights	Applied Learning	Integrated Academic Vocational Technical	Short Duration Learning Opportunities	Revise Curriculum
1982	Iowa Secondary School Principals Statewide Curriculum	*	*	*	*	*					*					
1982	Paideia Proposal by Mortimer J. Adler	*	*	*	*	*			*	*						*
1983	ASCD 17 School Network Recommendations	*	*	*	*	*	*	*	*		*	*	*		*	*
1983	National Commission on Excellence - A Nation at Risk	*	*	*	*	*	*		*	*	*	*				*
1983	Ernest Boyer - Report on Secondary Ed.	*	*	*	*	*	*	*	*		*		*			*
1983	Task Force on Education - Action for Excellence	*	*	*	*		*	*	*	*	*	*				*
1983	National Science Board Commission	*	*		*				*			*				*
1984	National Commission on Secondary Voc. Ed. - The Unfinished Agenda										*		*	*		*
1984	High Tech Schools - The Principal's Perspective	*	*	*	*	*	*	*	*		*					*
1986	New York - New Directions for Secondary Vocational Education								*		*		*	*		*
1989	Restructuring Secondary Voc. Ed - A Report by Staff of Wisconsin Dept. of Public Instruction & The University of Wisconsin - Whitewater						*				*		*	*		*
1990	MA Model Academic Project for Secondary Voc. Tech. High Schools	*	*	*	*	*	*	*	*		*	*	*	*	*	*

HOW THE REPORTS OF EDUCATIONAL EXCELLENCE DEFINED HIGH SCHOOL GRADUATION REQUIREMENTS

1982 Iowa Association of Secondary School Principals Statewide Curriculum Committee Study

Required Courses	Semester Credits
3+ years of English	6.4
3 years of Social Studies	5.5
2 years of Science	3.4
2 years of Mathematics	3.3
1/2 year of Foreign Language for college bound students	0.1

1982 The Paidea Proposal

The foremost principles promoted by this study are captured in quotations extracted from the Paideia Proposal:

According to the Paideia group, "The best education for the best is the best education for all," "there are no unteachable children. There are only schools and teachers and parents who fail to teach them." The twenty-five member group advocated for a one-track system of public education with the following objectives:

1. Basic schooling should provide students with opportunity for personal growth and self improvement — mental, moral and spiritual

2. Basic schooling should provide adequate preparation for discharging the duties and responsibilities of citizenship. This requires not only the cultivation of appropriate civic virtues, but also a sufficient understanding to the framework of our government and of its fundamental principles

3. Basic schooling must prepare future adults to earn a living by giving them the basic skills that are common to all work in our society.

The core of the Paideia Proposal is found within three distinct modes of teaching and learning which rise in successive gradations of complexity and difficulty during a 1-12 grade curriculum. The different modes of teaching correspond to three different ways in which the mind can be improved — (1) via the acquisition of organized knowledge; (2) via the development of intellectual skills; and (3) via the enlargement of understanding, insight and aesthetic appreciation.

A summary of the contents found within each category is provided to offer additional insight into this model. It should be noted that the contributors to this model favored a progressive curriculum which (for the most part) would run through all twelve (K-12) years of a student's education. The following three categories do not correspond to separate courses, nor is one type of teaching and learning necessarily confined to any one class:

Figure IV

A. Goals

Acquisition of Organized Knowledge by means of Development of Intellectual Skills, Skills of Learning by means of Enlarged Understanding of Ideas and Values

B. Means

Didactic Instruction Lectures and Responses Textbooks and Other Aids in three areas of subject matter Coaching, Exercises, and Supervised Practice in the operation of Maieutic or Socratic Questioning and Active Participation

C. Areas Operations and Activities

Language, Literature, and Fine Arts Mathematics and Natural Science, History, Geography, and Social Studies Reading, Writing, Speaking, Listening, Calculating, Problem Solving, Observing, Measuring, Estimating, Exercising Critical Judgment, Visual Arts Discussion of Books (not textbooks) and Other Works of Art and involvement in Artistic Activities e.g., Music, Drama

Although there is no clear demarcation for learning intended solely for the secondary level, the following essentials within the high school experience are encouraged by the Paideia Group:

- The math curriculum should consist of no less than one year of calculus with at least introductory instruction in the use of, and programming for, computers.

- Instruction in the natural sciences including physics, chemistry and biology

- History and geography are to be understood as including our knowledge of human and social affairs, not only within the boundaries of our own nation, but with regard to the rest of the world. Formal social studies instruction should be sequential and systematic combining a narration of events with knowledge of social, political and economic institutions and diverse phases of cultural development.

- The acquisition of a second language with a selection to be made among French, German, Italian, Spanish, Russian, Chinese and possibly others it may even extend to Latin and Greek.

- Exercises and seminars in the performance and composition of poetry, music and visual works, as well as in the production of dramatic works will help develop the necessary appreciation in a most direct manner.

- Health instruction, physical education and participation in intramural sports and athletic exercises.

- Instruction in the selection and securement of a career via exposure to different occupations; their significance and requirements; their rewards and opportunities.

1983 National Commission on Excellence in Education- *A Nation at Risk: The Imperative for Educational Reform*

Required Courses	Semester Credits
4 years of English	8.0
3 years of Mathematics	6.0
3 years of Science	6.0
3 Years of Social Studies	6.0
1 semester of Computer Science	1.0
2 years of Foreign Language for college bound students	4.0

1983 Association for Supervision and Curriculum Development (ASCD) Seventeen School Network Recommendations for Secondary Education

Recommendations:

The curriculum should address the following competencies:

1. Students must utilize symbols for computation and communication as a basis for continued learning
2. Students must know how to locate and process data
3. Students must be capable of making decisions
4. Students must be able to cope with change
5. Students must use creative imagination
6. Students must recognize the interdependence of all people on earth, the value in the variety of world cultures and the need for a knowledge of history and geography.
7. Students must possess a sense of self-worth, an appreciation of the intrinsic value of human life and a recognition of the uniqueness of each individual's potential.

Requirements for the ideal high school curriculum:

2 credits	Mathematics
2 credits	Mathematics or equivalent
2 credits	Science
1 credit	Health
2 credits	Electives to be selected from the Mathematics, Science and Technology Clusters
6 credits	English
2 credits	Electives to be selected from the Communications Cluster
2 credits	American History
2 credits	World History or equivalent
4 credits	Electives to be selected from the Historical, Cultural, and Global Studies Clusters but no more than 2 in each area
1 credit	Consumer Education or equivalent
2 credits	Electives to be selected from the Practical Arts Cluster
4 credits	Physical Education - 1/2 credit for every semester a student attends school up through eight semesters (4 credit maximum)
2 credits	Fine and Performing Arts Cluster

Completing these cluster requirements will yield 34 credits in four years of high school. Students must complete six additional credits in freely chosen electives to graduate with a total of 40 credits. Regardless of accumulated credits, students are required to complete at least four courses per semester for eight semesters.

The ASCD study group also proposed that computers be incorporated as a learning tool within all courses and clusters. Students would also be required to demonstrate oral communication skills as a component of their total academic learning environment.

1983 National Commission on Excellence in Education - *A Nation at Risk The Imperative for Educational Reform*

Required Courses	Semester Credits
4 years of English	8.0
3 years of Mathematics	6.0
3 years of Science	6.0
3 years of Social Studies	6.0
1 semester of Computer Science	1.0
2 years of Foreign Language for college bound students	4.0

1983 Ernest L. Boyer's High School: *A Report on Secondary Education in America*

Prerequisites:

English skills of all students should be assessed prior to entering high school.

All students should have one course which emphasizes writing with the class limited to twenty students and the teacher assigned no more than two writing assignments.

Core Curriculum-Represents 2/3 of the curriculum

2 years of required Mathematics
2 years of required Science
2 years of required Foreign Language (preferably Spanish)

Coursework in the following:

Literature
History
Western & Non-Western Civilization
The Arts
Civics
Technology
Health
Work (one semester on attitudes)

One written independent project required of all Seniors

Boyer requirements might be translated as follows:

Non-College Bound Students

3 years of Mathematics-includes one year of Algebra and one semester of Computer Science
3 years of Science
3 years of Technology
2 years of Foreign Language
Controlled/Competency assessed writing skills coursework
Other required coursework

College Bound Students

4 years of Mathematics-includes two years of Algebra, coursework on probability and statistics and one semester of Computer Science
4 years of Science-includes physics and chemistry
3 years of Technology
2 years of Foreign Language
Controlled/Competency assessed writing skills coursework
Other required coursework

1983 Task Force on Education for Economic Growth - *Action for Excellence*

Recommendations:

1. Broaden the definition of "basic skills" and reinforce the "mastery of higher order skills" related to productive employment.
    a. Basic skills would include: reading, writing, speaking, listening, mathematics and science.

   b. Additional competency categories include: reasoning, economics, computer literacy, and basic employment (which includes good citizenship).

2. Increased time and intensified work in academic subjects are paramount.

1983 National Science Board Commission - *Educating America for the 21st Century: A Plan of Action for Improving Mathematics, Science and Technology for All American Elementary and Secondary Students so that their Achievement is the Best in the World by 1995*

Recommendations

Focus upon basics which would include reading, writing and arithmetic and include communication, higher problem-solving skills, and scientific and technological literacy. In summary, the thinking tools that permit individuals to comprehend the world of technology.

Requirements: **Non-College Bound Students**

3 years of Mathematics - Includes one year of Algebra

3 years of Science and Technology - Includes one semester of Computer Science

Requirements: **College Bound Students**

4 years of Mathematics - Includes two years of Algebra and coursework in probability and statistics

4 years of Science - includes Physics, Chemistry and one semester of Computer Science

1984 High Tech Schools: *The Principal's Perspective*

Recommendations

1. Future educational needs should shape the curriculum. Connecting curriculum offerings with emerging trends will promote:

   a. an increase in foreign language studies
   b. additional coursework addressing global societies and the cultural characteristics of various nations
   c. a revamping of career education matching courses of study with relevant future market place fluctuations
   d. an expansion of all forms of communication skills (reading, writing, listening and interpretation)
   e. fostering course learning which incorporate higher order thinking skills such as problem solving, decision making, analytical reasoning and synthesis
   f. keyboard skills which commence at the feeder school level.

2. All students must become computer literate. Students should gain a substantial level of computer awareness and develop a functional level of skill applying computers as an aid to problem solving within a variety of disciplines.

3. All aspects of the curriculum should be examined in light of the existence and increased potential of computer-assisted instruction (please note this report views computer literacy as separate and distinct from CAI).

4. Schools should initiate a plan for curriculum mapping

    a. Local educators need to regularly chart out the core scope and sequence of content and skills to be delivered to students.

5. Schools need to devise means of evaluating and selecting computer hardware and software which best meets the particular needs of the school.

6. Schools must strengthen the recognition of students' academic achievement, particularly in areas such as Math, Science, and Career Preparation.

1984 National Commission on Secondary Vocational Education: *The Unfinished Agenda*

Recommendations

1. Develop opportunities for role learning, applicative learning, problem solving and creativity which transcend academic and vocational courses.

2. Conceptualize knowledge, devise organizational arrangements, develop instructional methods and implement administrative procedures which assure students opportunities to experience the interrelatedness of ideas, the implications and applications of knowledge and the process of discovery, dissemination and use of information.

3. Make the theoretical and empirical bases as well as the practical and applicative aspects of academic and vocational courses explicit and meaningful.

4. Arrange the content of vocational student's experience to include interships in the community, part-time employment, special projects and independent studies.

5. Mirror exploratory experiences with the realities of the workplace. General employability skills should be jointly identified by members of the educational community and potential employers. The concepts of work and family should address such areas as providing adequate care of young children while parents are at work, managing time and other resources and coping with stress resulting from dual responsibilities of work and family.

6. Base the occupational skills portion of the curriculum upon an analysis of the occupation for which the training is provided. In addition, business, industry and labor must be involved in vocational curriculum development and revision activities on a continuous basis to keep curricula current with technological advances.

7. Include recognized vocational student organization activity as an integral

component of classroom instruction. Vocational student organizations enhance motivation, occupational competence, leadership skills and the total development of the student in a unique setting involving both cooperative and competitive activities.

8. Provide instruction and practice in the basic skills of reading, writing, arithmetic, speaking, listening and problem solving.

9. Develop learning activities which develop self-esteem, positive attitudes toward work, safe work habits, job seeking skills and other employability skills.

10. Arrange vocational education courses so that they are enriched and diversified and therefore attractive to all students including the college bound.

11. Permit students to satisfy some graduation requirement via selected courses of vocational education that are comparable in content coverage and rigor with their academic counterpart.

12. States should not mandate curricular requirements which restrict students' opportunities to participate in vocational education experiences.

1986 *New Directions for Vocational Education at the Secondary Level (James A. Kadamus and William R. Daggett)*

High School Diploma Requirements

4 Units in English
2 Units in Mathematics
2 Units in Science
1 Unit in Art and/or Music
5 Units in Health Education
2 Units in Physical Education
3 Units in a second language

In addition, each diploma candidate would be required to complete one of the following: two 3-unit sequences or one 5-unit sequence from among the instructional areas of Occupational Education, Mathematics, Science, Second Language, Art and/or Music; or one 3-unit sequence in the above disciplines and one 5-unit sequence in either English or Social Studies.

Additional descriptive information extracted from the New York (1986) Model: Grades 9 and 10 program

Commencing with the class of 1992, all students following an occupational education sequence must successfully complete a minimum of one unit, and in some sequences, two units, in Introduction to Occupations. This instruction will typically occur in grades 9 and 10. The course content and competencies focus on occupational awareness, job readiness, and occupational preparation for broad career options. These skills and knowledges can be offered in a standalone course in Introduction to Occupations or may be integrated into specialized occupational courses. The course is designed as a transition from Home and Career Skills and Introduction to Technology, which all students will have taken in grades 7 and 8, to the specialized courses offered in grades 11 and 12.

Included as part of any Introduction to Occupations course will be instruction in two required 9-week modules: Personal Resource Management and Working Citizen. To meet the remainder of the 36-week minimum requirement for Introduction to Occupations, each district will select from a series of optional modules. These modules have been developed around, and relate to, the business, health, service, trade, technical, technology, and agriculture programs. Certain important competencies, known as process skills, have been integrated as appropriate into the modules' performance objectives and instructional strategies: Human Relations/Leadership, Safety/Work Habits, Mathematics/Science, Career Options, Use of Technology, Decision Making/Problem Solving, and Communications.

Occupationally Related Courses for General Education Credit

A series of occupationally related courses has been identified that may be used for general education credit. As part of the new diploma requirements in New York's Action Plan, all students must complete two units in mathematics and two units in Science at the high school level, beginning with the class of 1988. New York's guidelines have been developed to permit occupationally related Mathematics and Science courses to fulfill second unit requirements for students who are candidates for a local diploma and in some cases, a Regents diploma.

New York's syllabi for occupationally related Mathematics and Science courses have been developed by State Education Department curriculum teams. The teams have identified content for application both as free-standing courses and as integral parts of occupational program modules. The curricula for the occupationally related Mathematics and Science courses afford maximum flexibility to districts. Modules have been outlined so that they may be selected and sequenced to satisfy the needs and interests of individual students or classes as well as to prepare students for the career opportunities unique to an employment area.

The New York State Board of Regents have approved the use of a series of other occupational education courses to fulfill general education graduation requirements. Among those courses is the Business Communications course, which is a core course within the Business Education program and may be used to fulfill the fourth unit of English credit. Mechanical Drawing, part of the technology program and in some cases the trade program, may be used to fulfill the one unit of Art requirement that is needed for graduation. Other courses in Occupational Education that may be used for general education credit include Business Law, to fulfill a unit of the Social Studies requirement; the Technology Education Technical Writing course, which may be used to fulfill a unit of English requirement; and the Health Occupations Education core, which may be used to fulfill the Health requirement for graduation.

Grades 11 and 12 Programs

In grades 11 and 12, the Occupational Education program permits students to concentrate on one or more occupational clusters and to develop entry-level job skills. Instruction in each specialized area begins with a core course of one or two units. The number of additional courses (units) that students are required to take for a sequence in a particular specialization area varies from three to six.

Schools offering occupational preparation programs will be permitted considerable latitude in the organizational and scheduling of the modules to be covered, usually over a 2-year period. Some schools may organize modules to permit postponement of specific occupational preparation until grade 12, while others will begin such programs in grade 10.

A statewide vocational education testing program, based on the state syllabi, will be put in place. Vocational education students must pass the appropriate exams in order to graduate.

1989 Wisconsin Department of Public Instruction/University of Wisconsin - *Whitewater Parker Project's: Model for Restructuring Vocational Education*

As an alternative to traditional vocational training paths, this model advocates for a cohesive and coordinated training at the feeding system level (grades 6,7,& 8) and then progressing through the following semester courses which would be open to all secondary students:

1. Communications - including information processing (especially computer applications), business report and letter writing, and grammar and sentence structure

2. Employability Skills and Attitudes - Including job seeking and getting skills, development of work attitudes, and human relations

3. Management and Leadership Development - including principles of management, decision-making, and problem solving

4. Technology and Computer Science - including computer literacy, principles of technology and experiences with technology

5. Family and Consumer Living - including family relationships, child development, and consumer rights and responsibilities

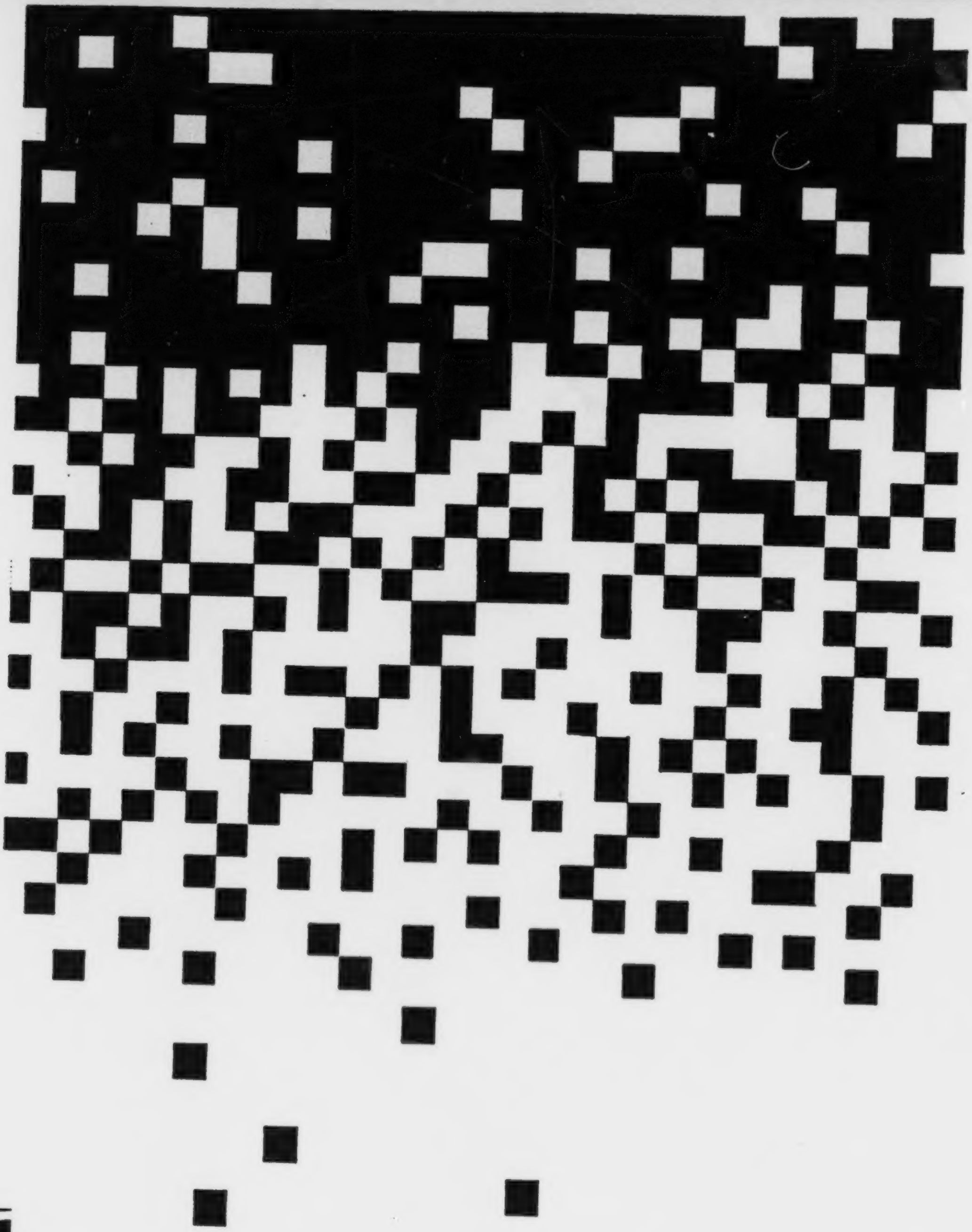
6. Field Experience - including assessment of interests and abilities, study of labor market information, job shadowing or school-supervised work experiences (with employer evaluations, job rotations, and limits on the number of hours worked) - Experiences would possibly, but not necessarily be related to a vocational career objective

7. Business Operations, Economics, and Entrepreneurship - including business planning and operations, practical economics, and entrepreneurship.

This design suggests that approved vocational instructors would be responsible for teaching the units identified above. Students interested in traditional vocational technical preparation or pursuing post secondary technical colleges or universities would specialize in structured, in-depth occupational training at the junior and senior high school level.

A major recommendation of the project was that neither academic skills nor vocational education alone could provide students with the skills necessary for today's job market. The model led to a legislative mandate that public schools provide all students with an education for employment plan based upon seven components:

(continued on page 24)



Exploratory Programs

1. The practical application of basic skills in both the general and vocational technical curriculum
2. Knowledge of business operations and economics
3. School-supervised work experience
4. Career exploration
5. Business and education partnership councils
6. Contemporary vocational education programs accessible to students in grades 9 -12 and based on labor market information
7. The development of employability skills.

IV. EXPLORATORY PROGRAMS

AVENUES FOR EFFECTIVE STUDENT PLACEMENT

A. OVERVIEW

Many vocational technical school systems employ exploratory programs as a technique for assisting entry level students in selecting career training paths. Vocational technical personnel have found that when students are allowed the opportunity to select and explore various occupational programs of their own choosing, they transition more easily from the sending school district into the unfamiliar vocational technical environment.

In vocational technical high schools, the high school principal and director of vocational technical education have joint responsibility for planning and implementing exploratory and training programs and activities in which vocational technical and other students jointly participate, including interrelated academic and vocational technical programming and scheduling of students. Both shall be responsible to infuse equity into all programs to ensure opportunities are available to all historically under-represented groups including racial and/or linguistic minorities, when applicable and handicapped students and students in programs nontraditional for their sex. Both shall insure that presentations about harassment and the prevention of harassment are included. Joint responsibility shall include: program planning to integrate basic skills, academics and vocational technical instruction; providing all students with occupational attitudes and knowledge; ensuring the participation of vocational technical students in academic, career-oriented and co-curricular activities; recommending eligible vocational technical students for high school athletics and scheduling physical education and athletic programs; assigning high school teachers to an integrated academic/vocational technical program; assigning rooms; ensuring the participation of vocational technical students in assemblies; recommending high school students for transfer to a vocational technical program or from a vocational technical program to an academic program; and ensuring that sending schools provide equal access to all students in attending vocational technical recruitment activities.

These programs not only help increase a new student's sense of confidence, competence and self-worth as she/he maneuvers through a short rotation in each chosen shop, but they also provide the opportunity for school personnel to observe the student in action. Student interest combined with instructor observation provides some of the information necessary for effective student placement. With the advent of the regional assessment center concept promoted by the Massachusetts Department of Education, Division of Occupational Education (Bureau of Program Services), the academic and technical skills of each student can now be determined, thus providing additional, critical information to define more precisely and to shape the exploratory process for each student. These assessments offer the prescriptive data which allow students to make more informed, tailored shop selections based on interest and academic and technical strengths as they plan and structure their exploratory choices.

In addition, upon completion of the exploratory, those students whose academic skill levels do not match the levels needed for their final shop selection can be targeted for immediate remedial assistance in an effort to ensure a successful shop placement for the student without sacrificing motivational interest.

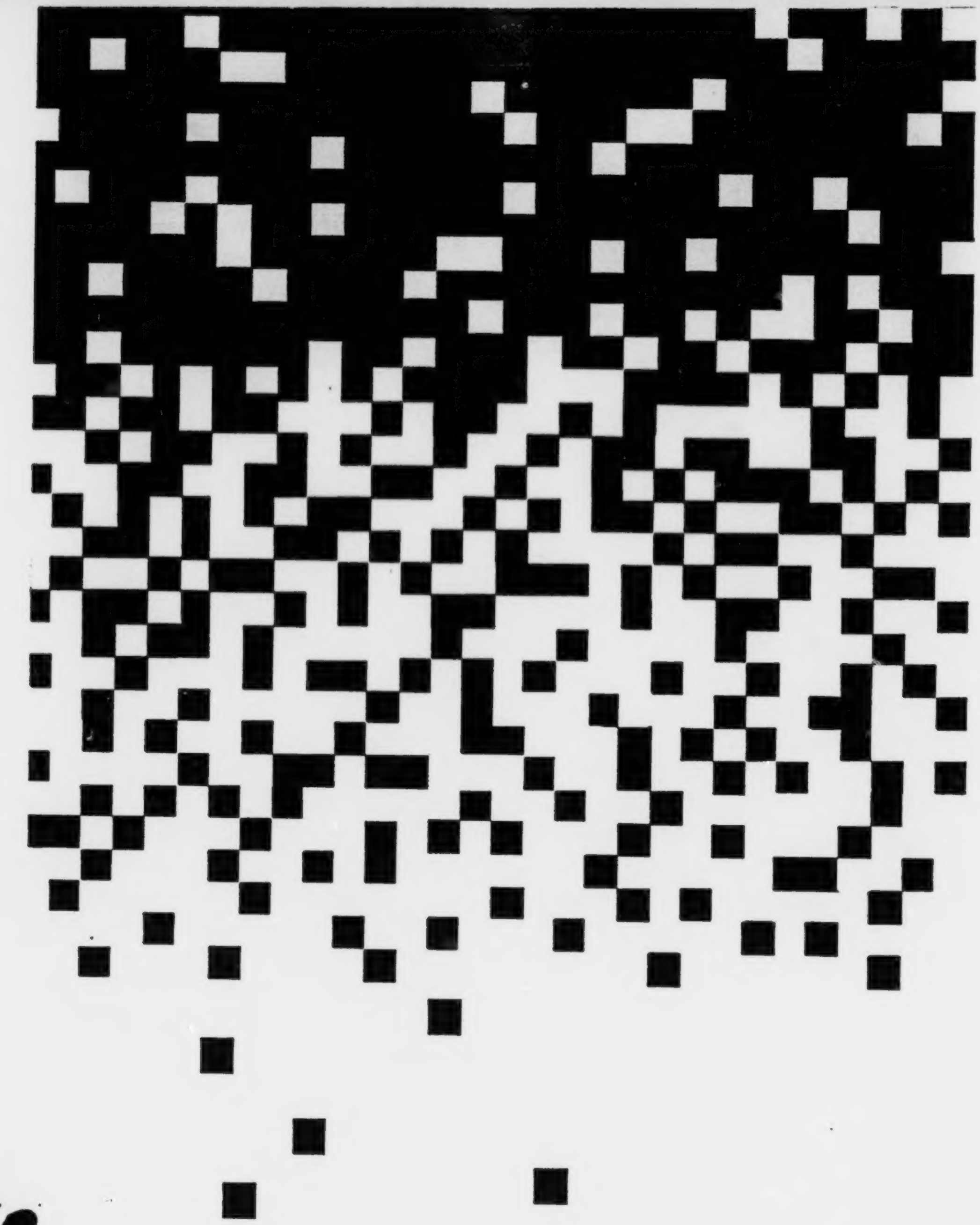
B. RECOMMENDATIONS

1. Establish middle school and pre high school entry exploratory programs of short duration which do not tax academic scheduling demands nor negatively impact upon the limited amount of time available for the activities which traditionally comprise the "feeder" school experience.

2. Emphasize activities which unleash the imagination and challenge the creative talents of students while exposing them to varied career fields. Exploratory experiences should enable students to shape personal, educational, vocational technical plans and assist them in recognizing their potential. Learning activities which foster creative thinking, communication, forecasting, decision-making, problem resolution, and planning skills provide an excellent format for exploring the opportunities and challenges of the secondary vocational technical experience.

3. Establish a systemwide career education curriculum which promotes significant contact and involvement with sending schools. Although project participants recognized dependency upon the level of cooperation extended by sending school personnel, it was believed that maximum benefit was achieved when the curriculum was both systematic and coordinated throughout the middle school and secondary vocational technical system. Such a curriculum would establish feeder school learning activities which ask students to examine personal attributes and qualities, demonstrate basic work habits and skills, consider and rank personal preferences, illustrate familiarity with the world of work and manifest career exploration and prevocational skills. Group members advocated early vocational technical school acceptance incentives and reentry programs and services which expanded the affiliation between the vocational technical school and its eventual student client.

4. Increase contact with preentry candidates via the Regional Academic/Technical Assessment Center in an effort to acquire data for improved student placement and program planning.



Related Theory

V. RELATED THEORY

The Model Academic Project contributors voiced support for a system of related instruction which coincides with that proposed within the draft regulations to amend Chapter 74 to include Chapter 731 of the Acts of 1989, An Act to Improve Vocational Technical Education. An extraction from Chapter 731 is provided to enable the reader to gain insight into the position fostered within these (draft) regulations:

Instructional methodology utilized in vocational technical education programs refers to the manner and/or processes in which students develop the requisite skills, knowledge and attitudes to succeed in the occupational area which they have chosen. Each school district desiring to obtain approval for M.G.L. Ch. 74 vocational technical program shall demonstrate that it will use instructional methodology determined to be the most effective and efficient for the program and which will result in the students obtaining the level of proficiency required to obtain entry-level employment. Due consideration will be given to the coordination and integration of the content presented through different instructional approaches to ensure that the information given is relevant to program objectives. The following characteristics should be emphasized:

(1) A full time program shall include not less than the number of hours in a school day as established by the Board of Education. For vocational technical programs in all occupational areas, laboratory, (shop) and work experience instruction shall comprise one-half the length of time of the school day uninterrupted, or the equivalent thereof, such as alternating weeks or days, the scheduling of which shall be subject to approval of the Division of Occupational Education. One half of the length of time of the school day, or the equivalent thereof, shall comprise academic and related study.

(2) School districts which offer vocational technical programs must also offer quality, effective academic programs which benefit vocational technical programs, are current and futuristic, and provide options for further or higher education. All teachers, vocational technical and academic, have joint responsibility for the improvement and reinforcement of the basic and academic skills of their students. Vocational technical students must be enrolled in a vocational technical education program and in an academic or related course throughout secondary programs. No other activity may be substituted for the aforementioned categories without prior approval from the Department of Education.

(3) There must be curricular integration of academic and vocational technical education programs in a vocational technical setting. By June 30, 1991, all school districts with vocational technical education programs must submit an Integrated Education Plan to the Department of Education. Any subsequent amendments to this plan must also be filed with the Department of Education.

(4) Related Instruction

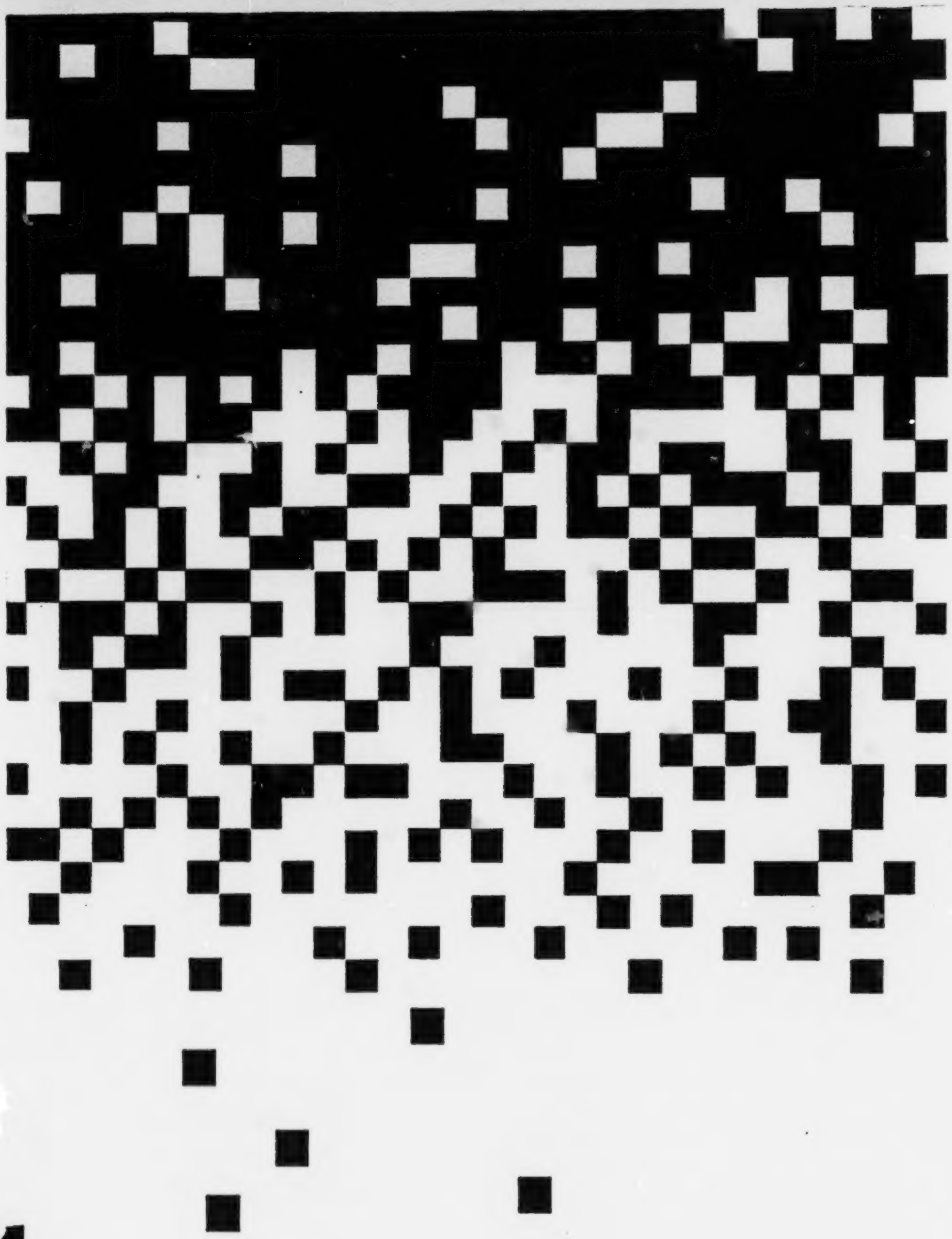
(a) Related instruction is that body of knowledge purposely organized and sequentially presented by an approved vocational technical instructor, which introduces, explains and/or amplifies theory and/or augments fundamentals that are essential and directly associated with and are unique to the acquisition of vocational technical competencies linked to the program in which students are engaged.

(b) Related instruction may vary based upon the demonstrated need of a particular program and may be offered during laboratory time. A school district must receive prior approval from the Department of Education on a program-by-program basis in order to implement a related instruction component.

(5) All instruction, vocation technical, academic and related, shall be free of sex/race bias and stereotyping...

Project participants recognized that the Massachusetts Vocational Association (MVA), the Massachusetts Association of Vocational Administrators (MAVA) and the Division of Occupational Education have lobbied aggressively to protect the related theory component of the secondary vocational technical curriculum. Representatives of these organizations have cited the critical and parallel learning provided through the related classroom setting and the dependency upon such if meaningful psychomotor learning is to take place during laboratory experiences. To address the expanded academic requirements and respond to the voiced needs and recommendations of vocational technical colleagues, the model academic project encourages "related" instruction which varies according to the vocational or technical career interest. In some cases this might translate into, or equate to, a single period of related instruction, each day during an eight or seven period day with full week laboratory instruction occurring every other week.

It is expected that all related instruction will reinforce basic academic skills and be directly associated with the vocational technical speciality taught within the laboratory. This arrangement should establish a strong theoretical concept base which articulates and enhances the instructional continuity and detail of laboratory learning. Related instruction should also foster basic skills and other academic learning. Project participants felt ample evidence exists to substantiate the integration and promotion of communication, entrepreneurship, microcomputer literacy, cost/profit analysis, marketing and other skills via the related experience. In addition, the need for enthusiastic instruction and varied instructional strategies, such as lecture, discussion, demonstration, questioning, inquiry, simulation/games, individualized instruction, independent study and field experience, are integral aspects of related curriculum design and development.



The Central Role of the Teacher

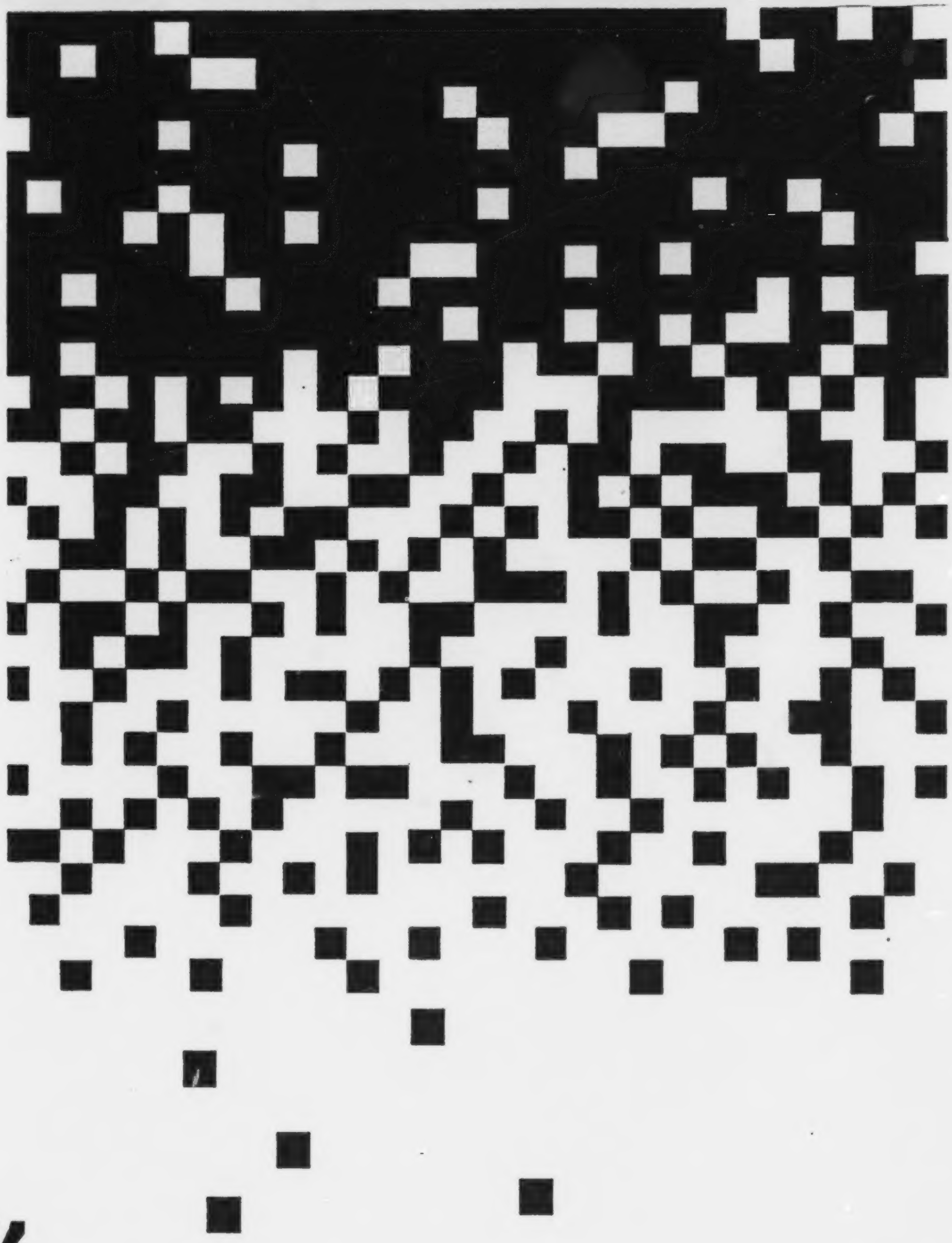
VI. THE CENTRAL ROLE OF THE TEACHER

Project input portrayed the teacher as a manager of students, equipment, space and activities. It was felt that teachers need to recognize the impact of "how" they communicate, in addition to "what" they communicate, if they are to truly teach students and not simply subjects. The expressions, mannerisms, attitudes, enthusiasm, likes, dislikes, approvals and disapprovals manifested by teachers during verbal and non-verbal communication govern actual student learning.

The tendency of students to pursue a level of achievement consistent with that set by teachers' expectation should not be ignored. The host of recommendations contained within the reports for improving secondary education within the United States (see Section III) provide teachers with ample evidence in which to devise yardsticks for measuring their teaching effectiveness. A common concept promoted within the volumes of literature and research on educational excellence is that the educational community must recognize that teachers and teaching styles make a significant difference in student learning.

In addition, if the educational system if to encourage cerebral activity beyond simple memorization and recall, it is the teacher who must be the vehicle for generating higher functioning inquiries. Participants acknowledge that textbooks, (major curricular determinants) can only be used as tools for fostering learning, not as instruments for stimulating higher levels of intellectual curiosity. They felt this was particularly true within subjects classified under the social studies cluster. The views of the Model Academic Project participants are supported by the findings of Kenneth T. Henson in his publication Methods and Strategies for Teaching in Secondary and Middle Schools (1988). Henson supports earlier research conducted by Miller and Vinocur in suggesting that teachers need to move from classroom activities which "state, name, identify, list, describe, relate, tell, call, give and locate" to include more realistic employment setting activities as "judge, compare, analyze, contrast, measure, appraise, estimate and differentiate." Eventually teachers may move on to creative and thought-stimulating learning activities which enable students to "make, design, create, construct, speculate, invent, devise, predict and hypothesize." The value of such student feedback and learning potential is even greater where academic settings are adapted to integrate and parallel the students' vocational technical shop experiences.

Participants advocated teaching strategies which provided for inquiry and discovery activity by students. They supported carefully selected projects and simulation games which motivate students and offer special opportunities for supplementing textbooks thus, enhancing the learning process.



Model Curriculum Recommendations

A. OVERVIEW

The structuring of an English curriculum in a vocational technical high school must take into consideration the multiplicity of learning styles, achievement and aptitude levels, and student interests, factors that any high school would contemplate in the creation of a pragmatic curriculum. In addition, vocational technical educators must be particularly sensitive to the diversity of needs of a student population with specific vocational technical goals which demand broad-based academic support.

This diversity of need directly impacts upon the English curriculum of a vocational technical high school in the following ways: specifically, the curriculum must deliver the general communication skills necessary for those students studying vocational technical areas which do not require the in-depth study of grammatical, written or literary topics. At the same time the curriculum must provide the intensity, breadth, substance and command of English that is essential for a student in a technical area where post-secondary study is the natural progression. Consequently, group consensus dictated the following parameters for course construction:

1. Courses

The two major divisions occurring within the following suggested curriculum are: (1) General English and (2) College Preparatory English. Both divisions subdivide each of its respective courses to include the four primary skills areas (reading, writing, listening and speaking) and the tasks for each area that a student should master at each appropriate grade level. In addition to these primary skills areas, research skills, study skills, and literary appreciation are included for the purpose of addressing individual student need as well as fulfilling academic expectations.

It is suggested that although the specific tasks which are identified on the following pages will be altered to accommodate individual English programs within individual schools, the primary focus of any curriculum should be the logical progression of practical skill development with appropriate reinforcement at each successive level.

2. Supplementary Courses

In addition to offering core courses, schools may want to consider designing courses which address the specific English/Communications needs of certain programmatic areas. A course entitled "Business Communications" may be offered to students in Data Processing, Marketing Education, or Business Technology, where a stronger emphasis is placed on business letters, forms, specific office communication skills and media. If school scheduling and staffing permit, elective courses focusing on designated literary periods, authors, genres, or various forms of written expression may also be incorporated into the English/Communications curriculum of a school. Each school should carefully consider the unique needs of its student body as it develops its English/Communications course options.

The following suggestions for a vocational technical English curriculum were devised with careful consideration given to the wide spectrum of student needs occurring in vocational technical schools throughout the state. The opinions expressed represent general conclusions drawn by the group and should in no way be construed as definitive statements. These suggestions represent only the initial attempt at creating a model English/Communication English/Communication curriculum.Additional teacher input and refinement are required.

B. IMPLEMENTATION ISSUES

1. Student Placement

The question of student placement in either the General or College Preparatory English courses must take into consideration:

a. Student Aptitude — Can a student successfully meet the challenges of an Advanced English course of study that emphasizes those skills necessary for college/post-secondary technical school preparation? Is a valid assessment provided for each student that determines her/his verbal/written abilities so that appropriate placement can be determined?

b. Future Goals — Does a student's career choice dictate further education that demands the type of preparation which College Preparatory English courses offer? Are the requirements of a student's vocational technical program area such that she/he needs more refined communication skills even if post-secondary education is not the next logical step?

c. Student Interest — Regardless of future goals, does a student have an interest in acquiring advanced communication skills? Does a student possess a proclivity for writing, literary analysis, and would consequently enjoy and be challenged by advanced course offerings?

Essential to such a decision is the role of individual counseling for the purpose of enabling a student to make an appropriate choice in determining her/his course of study in English. Students may not realize the importance or necessity of making this determination, and it is, therefore, the responsibility of the Guidance and English Departments to present both parents and students with the variables that must be considered before making the selection. A student's vocational technical area is a critical factor in this selection process. It is the responsibility of the school to provide the flexibility that would allow students to change from general to college preparatory (or vice versa) mid-stream in their education, as well as providing the appropriate incentives for tackling a more difficult course (i.e. advanced courses are weighted more heavily).

2. Methodology

Teacher methodology is the critical element in determining the success of any curriculum. Its importance overshadows those of course content and student placement combined. A teacher who is sensitive to the needs and learning styles of the students assigned to her/him for instruction will adapt presentations, course content, and learning activities to meet individual student needs, thus becoming a reflective practitioner.

Such an instructor designs the presentation of lessons mindful of the audience being addressed and discovers methods for motivating students to become active classroom participants. Creating alternative alternative activities within the classroom, she/he appeals to different interest and ability levels and provides enough variety to accommodate diverse learning styles (i.e., oral testing as well as written; resume writing presented as a large group activity prior to distribution of individual resume samples pertinent to individual shop areas).

Furthermore, the reflective practitioner strives to create a comfortable, positive classroom atmosphere where teachers and students explore together; where students experience the relevancy of the material presented; and where mistakes are viewed as opportunities for learning. The daily reflective process of what worked, what didn't, and how does one make it better is the cornerstone for successful teaching methodology, successful teacher and therefore, a successful curriculum.

C. **CURRICULUM OFFERINGS**: A COMPETENCY-BASED APPROACH

1. General English

GRADE 9

COURSE TITLES: English 9 (English I, Freshman English, Basic English Skills I, Communications I)

A. Study Skills (library usage, note-taking, following directions, test-taking, mnemonics)

B. Reading Skills (vocabulary development, spelling and usage, developing comprehension, finding main ideas)

C. Writing Skills (sentence structure, unity and coherence in paragraphs and letters, journal writing, social notes, business letters)

D. Literature (elements of fiction, biographies, selected readings, famous authors, appreciation short novels, introduction to types of literature)

E. Interpersonal (speaking and listening, short oral presentations) Skills

GRADE 10

COURSE TITLES: English 10 (English II, Sophomore English, Basic English Skills II, Communications II)

A. Research Skills (use of reference materials, outlining, summarizing)

B. Reading Skills (vocabulary development, spelling and usage, improved comprehension)

C. Writing Skills (paragraph writing, use of transition, technical writing, writing description, responding to essay questions)

D. Literature (non-fiction, elements of the short story, myths, figurative language, appreciation novels, plays)

E. Listening and (panel discussion, oral reports, note taking) Speaking Skills

GRADE 11

COURSE TITLES: English 11 (English III, Junior English, Basic English Skills III, Communications III)

A. Research Skills (locating information, career research, trade journals, documentary sources)

B. Reading Skills (vocabulary development, fact vs. opinion, inferences)

C. Writing Skills (resumes, technical reports, research reports, persuasive essays)

D. Literature (identification of themes and critical analysis of selected short stories, plays, appreciation novels and poems)

E. Listening and(opinion reports, critical reporting, introduction to the media, interview speaking skills techniques)

GRADE 12

COURSE TITLES: English 12 (English IV, Senior English, Basic English Skills IV, Communications IV, English on the Job)

A. Research/Study (resume preparations, career research continued, report research] Skills

B. Reading Skills (continued vocabulary development and study of inference)

C. Writing Skills (resumes, business letters, job application forms/cover letters, personal reflective essays, opinion papers, technical reports)

D. Literature (comparison and contrast, analyzing literary styles and author's technique, appreciation novels, plays)

E. Listening and (advanced interviewing techniques, debating, group dynamics] speaking skills)

2. College Preparatory English

GRADE 9

COURSE TITLES: Intermediate English 9 (College English I, Advanced English I)

A. Study Skills (organizing information, test-taking, outlining, note-taking, library usage with research emphasis, following directions, mnemonics)

B. Vocabulary (Greek and Latin roots, word relationships, prefixes, suffixes, building derivatives, etymologies)

C. Writing Skills (types of paragraphs, responding to essay questions, essay structure, creative expression)

D. Reading Skills identifying main ideas, drawing conclusions, fact vs. opinion, comparison and contrast, literal/inferential/critical differentiation)

E. Literature (literary genres, elements of fiction and novel study)

F. Listening and (oral reports, note-taking from lectures) Speaking Skills

GRADE 10

COURSE TITLES: Intermediate English 10 (College English II, Advanced English II)

A. Reading/Study (effective reading techniques, summarizing, paraphrasing, research skills)Skills

B. Vocabulary (analogies, literal and figurative language, recognizing context clues) Building

C. Writing Skills (expanded sentence structure, personal, descriptive and expository writing, introduction to writing research papers, precise writing)

D. Literature (elements of form and theme in selected short stories and novels, appreciation of poetry, introduction to drama)

E. Listening and (formal speeches, note-taking from lectures and textbooks) Speaking Skills

GRADE 11

COURSE TITLES: Intermediate English 11 (College English III, Advanced English III)

A. Study Skills (SAT preparation, test-taking tactics)

B. Composition (letters of application, the resume, literary analysis, descriptive and narrative essays, persuasive writing, research reports, developing individual writing styles)

C. Literature(critical analysis, interdependence of theme and form, famous authors, periods of literature, selected novels, plays and poems)

D. Listening and (debating techniques, defending opinion, directing discussion) Speaking Skills

GRADE 12

COURSE TITLES: Intermediate English 12 (College English IV, Advanced English IV)

A. Composition (formal research paper, creative writing, comparisons and contrasts of literacy selections)

B. Literature (analysis of style, literary techniques and character development in classical and contemporary literature)

C. Listening and(interview techniques, formal debate, impromptu speaking, extended oral Speaking Skills reports)

D. BIBLIOGRAPHY

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The following materials are available from the MVCRC by shelf number and title.

Shelf #	Title	Date
400 BERGE	Basic College Research Neal-Schuman Publishers, Inc.	1987
400 BICEP	Project BICEP, Study Skills: Who Needs Them? Levels 7-12, Barnstable Public Schools	1986
400 BRAGSD.	Guidebook for Teaching Study Skills and Motivation, Second Ed. Allyn & Bacon, Inc.	1987
400 CALIF	Vocational English-As-A-Second Language, Employment Competencies CA-Los Angeles Unified School District.	1984
400 CONN	English Curriculum Guideline, Grades 9 & 10 CN State Dept. of Education/Div. of Voc. Ed.	

Shelf #	Title	Date
400 DEVINE	Teaching Study Skills Allyn and Bacon	1987
400 FEARON Publishers	Getting Smarter, The Study Skills Improvement Program Fearon Education-Division of David Lake	1985
400 ILLINOIS	How to Study Illinois State BOE; Dept. of Adult Voc & Tech Ed.	
400 INTERNAT	Speaking Up At Work, Student Book, International Institute of MN-Oxford Univ. Press	1985
400 INTERNAT	Speaking Up At Work, Teacher's Manual, International Institute of MN-Oxford Univ. Press	1985
400 KRASKA	Communications Skills for Trade & Industry South-Western Publishing Co.	1985
400 MAGER	How to Write a Book Mager Associates	1986
400 MASS830	Study Skills Reading Mathematics: Related Vocational Curriculum Instructions, Minuteman Regional Vocational/Technical School District	1986
400 MOORE	Basics of Writing Reports Etc. Clive Bingley Limited	1985
400 NASSP	HM Study Skills Program: Level II, Teacher's Guide, Rev.Ed., Nat'l. Assoc. of Secondary School Principals	1986
400 NASSP	HM Study Skills Program: Level II, Student Text, Rev.Ed., Nat'l. Assoc. of Secondary School Principals	1986
400 OKLA	English II - Coordinated Voc Ed & Training (CVET) Oklahoma CIMC	1986
400 TX/CORD	Technical Communications TX/WACO, Center for Occupational Research & Development	1985
400 VAI	Video Verbal Review for the SAT-PSAT Video Aided Instruction, Inc.	1985
400 VAI	Video Math Review for the SAT-PSAT Video Aided Instruction, Inc.	1984

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428 ALVERMAN	Research Within Reach. A Research Guided Response to Concerns of Reading ED. International Reading Association, Inc.	1987
428 BARNETT	Writing for Technicians, 3rd Edition Delmar Publishers Inc.	1987
428 BICEP	How "Write" You Are. Strategies for Infusing Career Develop...English Curr. Barnstable Public Schools	1987
428 CONSORTI	Shifting Gears 2: A Teacher's Handbook (ESL) Consortium: Experiment in International Living	1984
428 DECKER	Newspaper Workshop. Workbook. Globe Book Company, Inc.	1985
428 EDDESIGN	Stories That Are Not Boring. (Includes Teacher's Guide) Educational Design, Inc.	1986
428 FEARON	Writing Makes Sense. Workbook, Fearon Education-David S. Lake Publishers	1987
428 GRANOWSK	Career Reading Skills. Book A. Workbook. Globe Book Company, Inc.	1984
428 GRANOWSK	Career Reading Skills, Book B, Workbook. Globe Book Company, Inc.	1984
428 GRANOWSK	Career Reading Skills, Book C. Workbook. Globe Book Company, Inc.	1984
428 MOSENFEL	Vocabulary for the World of Work 1; Basic Job Words. Educational Design, Inc.	1985
428 MOSENFEL	Vocabulary for the World of Work 2; Everyday Office & Business Words. Educational Design, Inc.	1985
428 NCTE	Writing Exercises From Exercise Exchange, Volume II. National Council of Teachers of English	1984
607 ILLINOIS	Communication Technology Curr. Guide Illinois State BOE; Dept. of Adult Voc & Tech Ed.	1984
607 MCSC	Communication Technology. Minnesota Curriculum Services Center	1986

Shelf #	Title	Date
640 OREGON	Teaching Strategies in Reading, Writing, & Math for Home Economics Education, Oregon Dept. of ED/Division of Vocational Education	1985
640.4 KESSLER	Writing for Life 1, Workbook. Globe Book Company, Inc.	1986
640.4 KESSLER	Writing for Life 2, Workbook. Globe Book Company, Inc.	1986
646 DRENNAN	Fashion Writing, Second Edition. Glencoe Publishing Company	1986
651.7 COMSTOCK	Communicating in Business and Industry Delmar Publishers Inc.	1985
651.7 HIMSTREE	Business Communications, Second Edition Glencoe Publishing Co.	1987

Suggested Book Titles

Grade 9

1. Tom Sawyer, Mark Twain
2. The Old Man and the Sea, Ernest Hemingway
3. The Cat Ate My Gymsuit, Paul Danzinger
4. The Pigman, Paul Zindel
5. West Side Story, Irving Shulman
6. When The Legends Die, Hal Borland
7. The Red Pony, John Steinbeck
8. The Pearl, John Steinbeck
9. The Yearling, Marjorie Rawlings
10. Diary of Anne Frank
11. Johnny Tremain, Esther Forbes
12. Captains Courageous, Rudyard Kipling
13. The Bumblebee Flies Anyway, R. Cormier
14. Romeo and Juliet, William Shakespeare
15. My Darling My Hamburger, Paul Zindel
16. A Day No Pigs Would Die, Robert Newton Peck
17. Where the Red Fern Grows, Wilson Rawls
18. The Call of The Wild, London
19. 12th Night, William Shakespeare

Grade 10

1. Red Badge of Courage, Crane
2. Julius Caesar, Shakespeare

3. April Morning, Howard Fast
4. Bless the Beasts and Children, Glendon Swarthout
5. A Separate Peace, John Knowles
6. Snowbound, Harry Mager
7. Scarlet Letter, Nathaniel Hawthorne
8. The Catcher In The Rye, Salinger
9. Hiroshima, John Hersey
10. Animal Farm, George Orwell
11. All Quiet on the Western Front, Erich Maria Lemarque
12. Light in the Forest, Conrad Richter
13. The Outsiders, S. E. Hinton
14. Death Be Not Proud, John Gunther
15. Pigman's Legacy, Paul Zindel
16. Black Like Me, John Griffin
17. The Good Earth, Pearl Buck
18. Treasure Island, R. L. Stevenson
19. Kidnapped, R. L. Stevenson
20. Huck Finn, Mark Twain

Grade 11

1. Of Mice and Men, John Steinbeck
2. The Hobbit, J. R. R. Tolkein
3. Deathwatch, Robb White
4. Best Short Stories of Jack London, edited by Jack London
5. Death of a Salesman, Arthur Miller
6. That Was Then, This Is Now, S. E. Hinton
7. Great Gatsby, F. Scott Fitzgerald
8. Lord of the Flies, William Golding
9. American West in Fiction
10. The Nick Adams Stories, Ernest Hemingway
11. Points of View, Ed. Moffett, edited by James Moffett and Kenneth R. McElheny
12. Macbeth, Shakespeare
13. The Natural, Malamud
14. The Contender, Robert Lipayte
15. Our Town, Thornton Wilder

Grade 12

1. Brave New World, Aldous Huxley
2. Up From Slavery, Booker T. Washington
3. Cry the Beloved Country, Alan Paton
4. Northwest Passage, Kenneth Roberts
5. My Fair Lady, Alan Lerner
6. The Lion in Winter, James Goldman
7. Silent Spring, Rachel Carson

8. One Flew Over the Cuckoos Nest, Ken Kesey
9. Farewell to Arms, Ernest Hemingway
10. High Wind in Jamaica, Richard Hughes
11. Farenheit 451, Jay Bradbury
12. Streetcar Named Desire, Tennessee Williams
13. 1984, George Orwell
14. Cat's Cradle, Kurt Vonnegut, Jr.
15. A Hitchhiker's Guide to Galaxy, Douglas Adams
16. Alice's Adventure in Wonderland, Lewis Carroll
17. Beowulf, Anonymous
18. Grendel, John C. Gardner
19. Utopia, Thomas Moore
20. Future Shock, Alvin Toffler
21. Anthem, Ayn Rand
22. We, Eugene Zemytin

E. ENGLISH SOFTWARE

Title	Vendor	Description
Mastering the Parts of Speech	SVE Software	Tutorial, drill and practice for verbs, nouns, pronouns, adjectives, adverbs, prepositions, and conjunctions.
Punctuation Series	Micro-Ed	Drill and practice. Student must identify error in a sentence. Programs tells if the answer is correct and provides the appropriate rule.
Spell It Plus!	Davidson & Associates	Game, tutorial. 1,000 of the most commonly misspelled words are used in ame format. Teachers can add their own words. Spelling rules are introduced as they apply.
Word Attack Plus!	Davidson & Associates	Game, drill and practice. Arcade-like game build vocabulary skills. 700 words with editor to add more. Definitions and context clues provided.

Title	Vendor	Description
Analogies ....Tutorial .....Advanced .....College Bound	Hartley	Tutorial. Program provides examples of types. of analogies and way to identify different kinds. Hints and explanations are provided for incorrect answers.Management system provided.
The Write Approach .....To Editing Skills II .....To Sentences II .....To Paragraphs II .....To Business English	Queue	Tool. Students edit sentences and paragraphs looking for punctuation errors, redundancies, voice errors, form/informal and language.
Improving Your Writing ......Obscurity ......Wordiness	Queue	Demonstration, practice. Program demonstrates problems of generalizations, cliches, euphemisms, redundancy, style constructions.
Crossword Magic	Mindscape	Tool. Allows teacher to create crossword puzzles using as many as thirty words.
The Novel Approach .....Animal Farm .....Lord of the Flies ....The Call of the Wild .....A Tale of Two Cities .....Romeo and Juliet	Mindscape	Tool. Focuses on character motivation, plot development, symbolism, narrative technique and vocabulary.
Word-A-Mation	Sunburst	Problem solving. Students learn about synonyms, antonyms, homophones, tense, spelling, and category names.
Writing .....a Narrative .....a Character Sketch	MECC	Tool. Open-ended question and examples provide writers with guidelines and frameworks to develop pre-writing skills.
Writing an Opinion Paper	MECC	Tool. Interactive examples and model topics help students distinguish between fact and opinion.

Title	Vendor	Description
Secondary Language Arts	Ideal Software	Tutorial, drill and practice. Requires Corvus or Apple Talk network. Software runs under management system and provides prescribed lessons for each student on the system over the full range of grammar.

MATHEMATICS REPORT

A. OVERVIEW

In today's rapidly advancing, rapidly changing, service-oriented, highly technical economy, all our citizens need basic skills to survive. They need to be able to communicate effectively and be aware of social changes. They need to know how to compute, to budget and to invest money in order to retain some of their income for daily living expense as well as future security. They need to know the science of their work related activities, but also the science of home maintenance, health maintenance and environmental maintenance. They need to have a sense of what has happened in the past, and why, enabling them to work with others in their community, be it local, state or national to prevent repetition of past mistakes.

The math cluster focused on the mathematic skills needed by the students of today to compete and serve the world of tomorrow. In constructing a curriculum, group members first considered the wide range of interests and abilities of the students they serve. The group matched students' needs,identified on the basis of instructional contact with students, discussions with employers and graduates, the findings of Massachusetts assessment tests administered within vocational technical schools and various research reports such as The Mathematics Reports Card (June, 1988 by Educational Testing Service), with the skills required in the training they have chosen. It is possible to break down and separate these needs and skills into dozens of categories, but the group felt that would be counter-productive and economically infeasible to maintain. Therefore, final suggestions stated that it is only necessary to develop three primary categories for student placement in mathematics. They are briefly outlined below. Included in this report is a more detailed curriculum outline for each category. From these three primary categories, individual course offerings can be developed to fulfill their implied concerns.

1. **Continuing Education/High Technology Math**
    a. Algebra I
    b. Plane Geometry
    c. Algebra II (Includes geometric and trigometric applications)
    d. Advanced Math

2. **Math for Daily Living**
    a. General Math
    b. Technical Math - Vocational or Technical Career Program
        Associated Algebra and Geometry
    c. Business/Career Math

3. **Developmental Math**
    a. Fundamental Skills Development (Remedial)
    b. General Math
    c. Applied Math
    d. Consumer Math

It should be understood that once a student is placed in one of these math clusters, she/he is not locked into it for the full four years. There must be the opportunity for mobility among the three categories to accommodate increased interest and/or rapid skill growth within individual students. The doors of opportunity must be kept open in both directions.

Study group members believe that by requiring math be taken each of the four years of high school, the concept of math as an important skill to be used every day is reinforced. Continued reinforcement at an early age prepares the student for skills needed today and allows for growth and opportunity for change in later years.

Each of the three categories has its particular curricular needs. Some of those needs are easily determined and material are readily accessible to address them. For example, curriculum outlines, excellent textbooks and easily duplicated workbooks and tests are presently on the bookshelves in all schools for Algebra, Geometry, Consumer Math and General Math. These only partially satisfy the mathematic needs of a vocational technical student. Students need curricular components that take into account math as it is applied to their individual vocational /technical training program. Many schools offer one approach or the other, but many do not incorporate both. Some schools offer math as a precise discipline, separate and distinct from vocational/technical training. Others prescribe math solely as a related component to the vocational program - each program teaching math only as to its application to.that particular vocational shop. It is easy to point out the shortcomings of both approaches. Student's needs and interests are not always taken into account The other doesn't provide for a change in direction or careers in the future. Neither adequately provides for everyday living experience that requires math skills to satisfy. What is needed is accommodation between these diverse approaches.

The committee to develop a model math curriculum believes that mathematics should be taught as a strict scholastic discipline as it is in non-vocational technical schools Mathematics teachers must hold the appropriate certification from the Massachusetts Department of Education. Math component contributors believe that the entire academic component of vocational education should be comparable to basic components of the academic programs in academic schools. Vocational technical students deserve to graduate with comparable academic skills as students from their sending communities. However, academic teachers in vocational technical schools cannot ignore the vocational technical needs and interests of their students either. Each unit taught must include vocational application for the variety of programs represented by students in a class. Development of this component of a math curriculum will require cooperation and coordination among math teachers, vocational technical instructors and administrators. This is neither a difficult nor an easy task, but is one that must be accomplished if vocational technical educators are truly interested in meeting the mathematical needs of our students.

The task is not without rewards however; the motivational effect upon a student in applying learned mathematical skills to vocational training is rewarding in itself. Also, the sharing of information about the student between a group of professionals is beneficial to all parties involved since the groups are working together in the best interest of the student.

In general, the curriculum outline for each subject at each grade level for each category should include the following:

1. Math Skills
2. Vocational Applications
3. Word Problems
4. Everyday life applications

If each course contains these four components, vocational technical specialists will not only meet the needs of students but provide them with skills which are comparable or surpass those of their non vocational technical contemporaries.

Report reviewers are encouraged to keep in mind that this report is not intended to serve as a comprehensive curriculum document. The report is extended as an outline of recommendations to address any observed inconsistencies in the delivery of the academic component of vocational technical education.

B. IMPLEMENTATION ISSUES

1. Placement

As important as identifying relevant competencies, developing appropriate curriculum outlines and guides, and establishing the necessary support mechanisms, there is more that must be done to establish a model program. Students must be placed into appropriate classes and shops commensurable with their abilities and their choices. Enough time must be scheduled in order to complete the entire proposed curriculum or vocational technical personnel do a disservice to students. Correlations should be drawn between the technicalities of the program area and the complexities of the math program to be successful in that vocational technical area. Students should not be placed in shop settings without the academic tools to be successful.

2. Scheduling

Scheduling has to be adjusted to provide a comparable time frame to teach academics to vocational technical students as is designed in comprehensive high school settings. The scheduling would enable the following critical situations to, occur:

a. Students who wish to continue their education or who are enrolled in certain high technology programs should receive four full years of mathematics education

    1. The mathematics program must be staffed by certified mathematic teachers.
    2. Offered two periods per day during the academic cycle (non-consecutive periods) on each of the four years (grades 9-12).
    3. Designed to offer a selection of courses in grade 12 commensurable with students' career goals (continuing education/higher education or immediate placement...)

b. Math for Daily Living and Developmental Math must receive two full years of mathematics education.

    1. Staffed by certified mathematics teachers
    2. Offered one period per day during their academic cycle for each of four years (grades 9-12).

c. Students must be offered the opportunity to move from one math category to another if they have demonstrated the ability to compete successfully in the new category. [Non-continuing education/high technology students should be rewarded with the opportunity to take high level math courses once they have mastered the basics.]

C. CURRICULUM OFFERINGS: CONTENT AND PROGRESSION

DEVELOPMENTAL MATH

GRADE 9

COURSE TITLES: **Fundamental Math**

Competencies

Understanding place value
Rounding numbers
Addition and subtraction of whole numbers
Multiplication and division of whole numbers
Determining the percent of a number
Addition and subtraction of decimals
Multiplication and division of decimals
Life skills applications
Conversion of fractions to decimals
Reduction of fractions and mixed numbers
Multiplication and division of fractions
Changing denominators
Addition and subtraction of fractions
Estimation
Reading graphs and charts
Performing linear measurement
Conversion of decimals to fractions
Related trade applications
Solving word problems
Using a calculator

GRADE 10

COURSE TITLES: **General Math, General Math II, Applied Math**

Arithmetic Competencies

Revision of basic arithmetic operations
Using whole numbers, decimals, fractions and percents
Integration of basic skills using a calculator
Integration of basic skills and measurements

Geometric Competencies

Understanding angles
Understanding triangles
Understanding perimeter using formulas

Understanding lines, points, planes
Understanding quadrilaterals
Understanding area of polygons using formulas
Understanding circumference & area of circles
Understanding volume using formulas
Understanding similar and congruent polygons
Performance of ratio and proportion problems
Understanding right angle trigonometry principles
Interpretation and construction of graphs and charts
Conversion of mixed measurements
Life skills applications
Related trade applications
Solving word problems

GRADE 11

COURSE TITLE: **Consumer Math**

Competencies

Revision of basic arithmetic operations utilizing whole numbers,decimals, fractions, and percentages
Savings accounts & loans-interest/formula
Housing costs
Record keeping
Personal budgets
Calculating net pay
Cash purchases
Checking accounts
Automobile costs
Calculator skills
Computer skills
Life skills applications

GRADE 12

COURSE TITLE: **Career Math**

Competencies

Utilization of basic skills to solve trade related problems
Introduction to integers
Solving simple linear equations
Additional calculator skills
Reinforcement of basic skills
Basic bookkeeping
Preparing invoices
Performing monetary operations
Life skills applications
Related trade applications
Solving word problems

MATH FOR DAILY LIVING

GRADE 9

COURSE TITLE: General Math

Competencies

- Performing arithmetic operations with incorporating whole numbers
- Performing arithmetic operations with decimals
- Performing arithmetic operations with fractions
- Performing arithmetic operations with measurements
- Solving proportion problems
- Solving percent problems
- Determining perimeter, area and volume
- Solving word problems

Additional Competencies (Introduced and integrated with above competencies)

- Determining reasonableness of answer
- Estimating
- Introduction to probability and statistics
- Calculator/computer use
- Note taking and organization skills

Emphasis

Continued evaluation is needed at this level to determine the student's math program for the succeeding three years.

Performance should determine whether a student demonstrates his/her skills upward and onward or whether they take slower steps to learn completely skills not fully developed.

Opportunities should be available to accelerate or decelerate as determined by evaluation and performance.

GRADES 10, 11, 12

COURSE TITLES: **General Math, Trade Related Algebra/Geometry, Consumer Math, Business Math, Career Math**

Competencies

Developed for each course consistent with the implied intent of each subject.

Developed allowing for varying level of skills development of students.

Developed incorporating program associated applications.

Including life skills applications using a calculator/computer solving word problems.

Emphasis

To broaden students' mathematic skills and applications to their programs, daily living needs and future growth potential.

HIGHER EDUCATION/HIGH TECHNOLOGY MATH

GRADE 9

COURSE TITLE: **Algebra I**

Topics

- Operations with signed numbers
- Simplifying expressions
- Solving equations (whole number coefficients)
- Word problems applications
- Solving inequalities
- Working with exponents
- Polynomial multiplication
- Polynomial factorizations
- Working with literal formulas
- Quadratic solutions (factoring)
- Operations on Algebra fractions
- Solving fractional equations
- Simplifying radicals
- Graphing
- Life skills applications
- Related trade applications

The above course is designed to prepare students for technical employment and/or post-secondary education.

GRADE 10

COURSE TITLE: **Plane Geometry**

Topics

- Figures and measures
- Introductory proofs
- Parallels
- Proving triangles congruent
- Applying congruent triangles
- Perimeter, area and volume of Geometric figures
- Solving word problems
- Polygons
- Quadrilaterals
- Similarity
- Circles
- Coordinate geometry
- Life skills applications
- Related trade applications

This course is designed to develop the deductive and analytic approach to those plane geometric concepts with which the students are often intuitively familiar.

GRADE 11

COURSE TITLE: Algebra II

Topics

- Review on linear equations and inequalities word problems
- Exponents
- Factoring and special products
  - Quadratic equations
  - Fractional equations
- Rational expressions
- Formulas
- Radicals
- Quadratic formula
- Coordinate geometry
  - System of equations
- Life skills applications
- Related trade applications
- Topics (time permitting)
- Introduction to functions
- Graphing functions
- Complex numbers
- Right angle trigonometry

The successful completion of Algebra I is a prerequisite for taking Algebra II. The course is recommended for students who are interested in post secondary or, higher education or employment in a field that uses higher order mathematics.

GRADE 12

COURSE TITLE: (Optional)

Advanced Mathematics
Business Math
Other Options

Competencies

Developed for each course consistent with the implied intent of each subject.

Emphasis

Options should be available to allow students to best fulfill her/his aspirations and goals for future needs of mathematical skills.

D. BIBLIOGRAPHY

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Kilpatrick, J. "A Retrospective Account of the Past Twenty-Five Years of Research on Technical Mathematical Problem Solving." In E. Silver (Ed.), Teaching and Learning Mathematical Problem Solving: Multiple Research Perspectives, pp. 1-15. Hillsdale, NJ: Lawrence Erlbaum Associates.	1985

Title	Date
Reed, S.K. "Estimating Answers to Algebra Word Problems." Journal of Experimental Psychology: Learning, Memory and Cognition, Vol. 10, pp. 778-790.	1984

The following materials are available from the MVCRC by shelf number and title.

Shelf #	Title	Date
510 EDDESIGN	Math: For the World of Work. Educational Design, Inc.	1985
510 ETS	Nation's Report Card; Mathematics; Are We Measuring Up? Educational Testing Service	1988
510 FEARON	Career Math Makes Sense, Workbook Fearon Education-David S. Lake Publishers	1986
510 ILLINOIS	Generalizable Mathematics Skills Assessment. IL/SBOE/Dept. of Adult, Vocational & Technical Ed.	1984
510 LOCKJ	Math in Action: Decimals and Percents. (Text) Janus Books	1987
510 MASS	Math & Science Competency Matrix MA/DOE/ Division of Occupational Education	1987
510 NEWY	Occupationally Related Mathematics, Draft Curriculum, New York State Education Dept/Div. of Occ Ed. Programs	1986
510 NEW YORK	Occupationally Related Mathematics Curriculum, New York Dept. of Education NY/DOE	1986
510.016 ILLINOIS	Generalizable Mathematics Skills. Resource Directory, IL/SBOE/Dept. of Adult, Vocational & Technical Ed.	1984
516 ALKAZIN	Descriptive Geometry Workbook Prakken Publications, Inc.	1985
516 STEWART	Applied Descriptive Geometry Delmar Publishers, Inc.	1986
001.64 MASS	Math & Science Competencies in Computer Technology, MA/DOE/Division of Occupational Education	1985

Shelf #	Title	Date
331.2 NEWJ	New Curriculum: Morris County Voc/Tech School, Morris County Vocational/Technical School, New Jersey	1987
371.12 PBTE	Assist Students in Improving Their Math Skills Module M-5. NCRVE/AAVIM	1985
400 MASS830	Study Skills Reading Mathematics: Related Vocational Curriculum Instruction. Minuteman Reg. Voc/Tech. School District	1986
400 VAI	Video Math Review for the SAT-PSAT Video Aided Instruction, Inc.	1984
510 OLIVO	Basic Vocational/Technical Mathematics Delmar Publishers, Inc.	1985
610.6953 MASS	Math & Science Competencies in Medical Assistant, MA/DOE, Division of Occupational Education	1986
610.6953 MASS	Math & Science Competencies in Health Assistant Training, MA/DOE, Division of Occupational Education	1985
621.31 MASS	Math & Science Competencies in Electrical Technology, MA/DOE, Division of Occupational Education	1986
629.28 MASS	Math & Science Competencies in Auto Mechanics, MA/DOE, Division of Occupational Education	1986
635 MASS	Math/Science Competencies in Ornamental Horticulture/Turf Management. MA, DOE, Division of Occupational Education	1985
640.0151 MONTANA	SMART (Science & Math Activities & Resources for Teaching) Home Economics. Montana State University/Department of Home Economics.	1986
641.3 MASS	Math & Science competencies in Food Management & Production Services. MA., DOE, Division of Occupational Education	1985
647.94 MASS	Math & Science Competencies in Hotel & Lodging MA/DOE, Division of Occupational Education	1986

Shelf #	Title	Date
658.8 MASS	Math & Science Competencies in General Merchandising, MA/DOE, Division of Occupational Education	1986
640 OREGON	Teaching Strategies in Reading, Writing, and Math for Home Economics Education. Oregon DOE, Division of Voc. Ed.	1985
642/0151 HAINES	Math Principles for Food Service Occupations. Second Edition. Delmar Publishers, Inc.	1988
650.10151 MARTINKA	Vocational Mathematics for Business. Third Edition. South-Western Publishing Co.	1984
671.520151 SCHELL	Practical Problems in Mathematics for Welders Third Edition. Delmar Publishers Inc.	1988
671.820151 MALONEY	Related Sheet Metal Mathematics for Grades 9-12, MA, Fitchburg State College.	1984
694.0151 HUTH	Practical Problems in Mathematics for Carpenters Fourth Edition. Delmar Publishers	1985

E. MATHEMATICS SOFTWARE

Title	Vendor	Description
Unit Conversions	International Computing, Inc.	Tool. Provides over 3,000 measurement conversions for 22 different measurement systems.
Physics Help Mathematics and Measurements	Focus Media	Tutorial. Tutors students and provides practice in measurement and mathematics.
The Metric System	Queue	Simulation, tutorial. Students learn to measure objects with the different measures in the system.
Reading Micrometers .....Outside Micrometers .....Inside Micrometers .....Depth Micrometers .....Vernier Calipers	Hearlihy and Co.	Tutorial. Use of high resolution graphics to illustrate micrometers in detail and show their functions.

Title	Vendor	Description
Vocational Math .....for Carpenters .....for Automotive .....Estimating Materials .....Welding	Shopware Education Systems	Tutorial. Diagnostic program with practical problems in vocational technical areas.
Reading the Ruler	Shopware Education Systems	Tutorial. Graphics and text reinforce subject matter.
Math Shop	Scholastic Software	Simulation. Students must solve math problems that are encountered in everyday work.
Whatsit Corporation	Sunburst	Simulation. Students use math skills to start and run a business.
The Factory, The Super Factory	Sunburst	Simulation. Students use problem solving skills and spatial geometry to solve problems.
Survival Math	Sunburst	Simulation. Students use math skills to solve everyday life problems from a travel agency to running a hot dog stand.
Math for Consumers	Queue	Drill and practice. Consumer related topics built around taxes, banking, shopping using competitive games.
Automotive Technician Mathematics .....Volume 1 Whole Numbers and Fractions .....Volume 2 Decimals and Percents	MECC	Drill and practice. Students can practice problems similar to those found on the job.
Math on the Job	Ideal Software	Tutorial, drill and practice. Requires Corvus and AppleTalk network. Software runs under management system and provides prescribed lessons for each student on system.

A. OVERVIEW

The objective of the science report was to present a professional teacher based recommendation on the quantity, quality and order of science curriculum that should be achieved in a vocational technical school setting. But agreeing on what is essential information and then organizing it for this project may cause some misunderstanding. As philosophies differ and arguments move from the importance of skills to concepts and back again, one element remains — positive personal experience. The tried and proven experiences of colleagues should be incorporated into this model. The essence of any model is more than information to be presented and learned, it is a means to an end. The end result is the response of the students to questions that make them think, explain and view the world of science as relevant and applicable to the world of work and their total environment. For this reason, the science group recommends that teachers and support staff periodically review the Math/Science Competency Project guidelines and encourage open discussion on program relevancy and effectiveness. In all the programs listed, it should be understood that the science group strongly supports classroom activities that present real world problems that require students to have certain information and skills in order to resolve them.

The great debate today is centered around the expansion of science curriculum offerings nationally. All school systems are being urged by leading professional groups such as the National Science Teachers Association and the National Science Foundation to teach science in a way that will enable all students to understand and apply it. This trend toward raising science and math requirements for graduation from high school has created a challenge; i.e. these courses must be coordinated so that they are not all highly abstract and theoretical. Programs that are offered in a vocational technical school setting have an outstanding opportunity to be applied courses that systematically introduce levels of facts and critical thinking skills from the descriptive level of emphasis through the empirical to the theoretical (abstract) levels.

One recommendation of the Model Academic Project envisions a collaborative effort within a school building or system that would emphasize scientific, mathematical and technological connections. An excellent example of this approach is the Science Technology Society (STS) of the National Science Teachers Association that relates science and technology to social issues. Like any exemplary program, STS goes beyond the classroom to help students realize that education is part of living and related to community issues. Students need to see how scientific knowledge can be used to study and solve current social issues. The scientific sophistication and application of technology on display at sites such as the Woods Hole Oceanographic Institution's Deep Submergence Laboratory, provides an excellent example of practical, field based scientific research. The Massachusetts Department of Education's (Div. of Occupational Education) Policy on Technical Education is also based upon the coordination of mathematics and science curriculum in concert with technology education.

Finally, for any model or program to have a chance at success, there must be total involvement and understanding among not only the teachers, but the administrators, parents and students themselves. To that end, the science recommendations provide positions from which an agenda for action may be constructed that suggests steps toward the improvement and refinement of a model science program.

B. IMPLEMENTATION ISSUES

1. Strengthening Requirements

The science representatives strongly agree that a vocational technical school course of study should offer each student four years of science. Because of the differences in hours offered across the state, the group emphasized that Carnegie Units be used as a yardstick when recommending four full years for a science course. In addition, there was a very strong feeling that the opportunity to meet Board of Regent's Requirements for post/secondary education be carefully reviewed by each school system in setting the goals and objectives of science programs. It has become very evident that the job market will continue to expand in the area of high technical skills occupations. Many occupations will require higher or further education and that path should always be open to the graduates of the vocational technical high schools. These occupations will require a solid scientific base. Providing that base in a high school environment requires schools to exceed the minimal State requirements for science education. An August 1988 Massachusetts Department of Education, Chapter 188 Report on High School Graduation Requirements indicated that 81% of the local school districts required at least two years of science.

1. Development of Learning Activities

The following recommendations were made for the development or acquisition of learning activities in a vocational technical school setting:

a. Encourage hands-on, activity-based science programs .

b. Base instructional materials and apparatus needed to investigate a science topic or modular units which are appropriate for the students.

c. Promote the development and use of locally produced materials in addition to state and national products.

d. Plan in-service teacher training, workshops, creativity sessions.

e. Ensure that lesson plans are in a format which simplify the design of competency based learning activities for students.

f. Organize teachers, counselors, and special-needs support staff to confront the most immediate as well as long-range curricular needs to support the integration of shop competencies and academic skills.

g. Emphasize active learning; i.e., experiences and projects, classroom student-teacher cooperation and student-student cooperation, provisions for individual differences, relating the program to life skills such as critical thinking, problem solving, evaluation, organization, synthesis, application and creativity.

C. CURRICULUM OFFERINGS: CONTENT AND PROGRESSION

1. COURSE TITLE: Biology

Equivalent Course Titles:

Basic Biology
Life Science
General Biology

a. Laboratory Equipment
    1. Identification, Use and Location of Laboratory Equipment
    2. Laboratory Safety
    3. Hazardous Materials (Right-to-Know Law)

b. Characteristics of Life
    1. Life Functions
    2. Cell Structure and Function
    3. Organization of Cells

c. Life Forms (Classification of Living Things)
    1. Protists and Monera
    2. Invertebrates
    3. Vertebrates
    4. Plants and Fungi

d. Life Functions of Living Things
    1. Locomotion
    2. Transport
    3. Nutrition/Photosynthesis
    4. Respiration (Right-to-Know-Law)
    5. Regulation/Sensation
    6. Reproduction
    7. Genetics
    8. Disease

e. Environment/Ecology
    1. Food Chains and Food Webs
    2. Individuals and Populations
    3. Communities and Ecosystems
    4. Conservation of Resources/Pollution

2. COURSE TITLE: **Chemistry**

Equivalent Course Title:

Introductory Chemistry

a. Safe Handling of Chemicals in the workplace (lab)

b. Atomic Measurement (lab)

c. Organization
    1. Atomic Structure (lab)
    2. Electron Configuration (lab)
    3. Periodic Table of Elements

d. Molecular Structure
    1. Chemical Bonds
    2. Chemical Composition (lab)
    3. Chemical Equations (lab)

e. Physical and Chemical Properties of Matter
    1. Gas Laws
    2. Liquids, Solids (lab)
    3. Elements, Compounds, Mixture (lab)

f. Solutions and Suspensions
    1. Definitions
    2. Ionization
    3. Acids, Bases, Salts (lab)

g. Chemical Reactions
    1. Chemical Kinetics
    2. Chemical Equilibrium (lab)
    3. Oxid-Red'n Reactions (lab)

h. Metals
    1. Gp I Metals, Na
    2. Gp II Metals, Mg (lab)
    3. Gp III Metals, Cu, Fe, etc. (lab)

i. Non-Metals
    1. N and its Compounds
    2. S and its Compounds (lab)
    3. Halogens (lab)

j. Carbon and its Compounds
    1. Carbon and its Oxides
    2. Hydrocarbons
    3. Hydrocarbon Substitution Reactions (lab)
    4. Natural Organic Compounds (lab), i.e., Fermentation/Distillation

k. Special Areas
   1. Plastics
   2. Agricultural Chemicals-Primary focus of this topic covered in Biology
   3. Foods (lab)-Primary focus of this topic covered in Biology
   4. Air

e. Water (lab)

4. COURSE TITLE: Earth and Environmental Sciences

Equivalent Course Titles:

Geology
Meteorology
Astronomy
Geography
Ecology
Earth Science
Oceanography

a. Full-year Earth Science course

b. Geology
   1. Observing, Measurement, Experimentation Process
   2. Earth Composition
      a. Minerals
      b. Rocks
      c. Weathering
      d. Resources and Energy
   3. Geography
   4. Active Earth
      a. Plate Tectonics
      b. Earthquakes and Volcanos
      c. Erosion
      d. Mountain Building
   5. Shaping the Land
      a. Water Cycle
      b. Glaciation
      c. Wind/Waves
   6. Air and Water
      a. Atmospheric Characteristics
      b. Weather
      c. Oceans/Geology
      d. Oceans/Chemistry and Biology
      e. Motions of the Seas
   7. Earth and Space Science
      a. Solar System (Structure and Origin)
      b. Earth In Space
      c. Earth/Moon Relationship
      d. Structure of the Sun
      e. Inner and Outer Planets
      f. Stars and Galaxy

4. COURSE TITLE: Physical Science

Equivalent Course Titles:

Physical Science-Special Topics (Electricity, Magnetism, Relativity)
Related Tech. Science

Science Technology & Society
Related Science
Related Physics

a. Metric System (Measurement)
    1. Length, Area, Volume, Mass/Weight

b. Scientific Method
    1. Six Steps Involved with Emphasis on Experimentation

c. Structures of Matter
    1. Structure/Atomic Model
    2. Properties of Matter
        a. Classifying, Working with Data, Changes (Chemical/ Physical)

d. Electrical Charges and Current
    1. Motion
    2. Force
    3. Energy/Heat/Work
    4. Charges
    5. Currents/Pressure
    6. Circuits
    7. Radioactivity

e. Magnetism
    1. Properties of Magnets
    2. Permanent and Temporary
    3. Electromagnetism

f. Simple Machines
    1. Motors
    2. Work
    3. Motion
    4. Hydraulics applications
    5. Refrigeration applications

g. Electrochemical and Nuclear Energy
    1. Electrochemical Charge
    2. Nuclear Change
    3. Radiation

h. Human Energy Needs
   1. Present Resources
   2. Alternative Sources (solar, geothermal, bioconversion)
   3. Energy Conservation

i. Sound
   1. Properties of Sound
   2. The Wave Model of Sound
   3. Listening to Sound

j. Light
   1. Properties of Light
   2. Color
   3. Models for Light

5. COURSE TITLE: **Physics**

Equivalent Course Titles:

Physics
Applied Physics
General Physics
Advanced Physics
Related - Principles of Technology
Physics Theory

a. One Full Year - Classroom and Lab of Physics. Math, Algebra, Scientific Notation

b. Exploring the Nature of Physics - Measurement

c. Force and Motion
   1. Analyzing a Set of Forces (resolution)
   2. Describing a Body in Motion
   3. Obtaining Mechanical Energy to Run Machines/Power

d. Work and Energy
   1. Conserving Mass, Energy and Momentum
   2. Using Simple Machines to Accomplish Work
   3. Obtaining Mechanical Energy to Run Machines/Power

e. Electricity and Magnetism
   1. Full lab, two periods total

f. Thermo Dynamics - Heat

g. Optics

h. Alternative Energies

D. BIBLIOGRAPHY

Title	Date
Champagne, A, and Klopfer, L. "Research in Science Education: The Cognitive Psychology Perspective." In D. Holdzkom and P. Lutz, Research Within Reach: Science Education Charleston, WV: Appalacia Educational Laboratory, Research and Development Interpretation Service ERIC Document No. ED 247148.	1984

The following materials are available from the MVCRC by shelf number and title.

SHELF #	TITLE	DATE
500 JANUS	Physical Science: Discovering Basic Concepts. Text. Janus Books	1987
500 JANUS	Physical Science: Discovering Basic Concepts. Lab Resource. Janus Books	1987
530 OLIVO	Fundamentals of Applied Physics. Third Edition Delmar Publishers, Inc.	1984
530 OLIV	Fundamentals of Applied Physics. Third Edition, Student Guide. Delmar Publishers Inc.	1984
530 TX/CORD	Principles of Technology, (units 1-7) CORD/AIT	1986
530 TX/CORD	Principles of Technology, (units 8-14) CORD/AIT	1986
001.64 MASS	Math & Science Competencies in Computer Technology MA/DOE/Division of Occupational Education	1985
331.2 NEWJ	New Curriculum: Mirris county Voc.-Tech. School Morris county Vocational/Technical School, New Jersey	1987
500 ETS	Nation's Report Card; Science Report Card; Elements of Risk and Recovery. Educational Testing Service	1988
610.6953 MASS	Math & Science Competencies in Health Assistant Training, MA /DOE, Division of Occupational Education	1985
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621.31 MASS	Math & Science Competencies in Electrical Technology MA/DOE, Division of Occupational Education	1986
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641.3 MASS	Math & Science competencies in Food Management & Production Services. MA /DOE, Division of Occupational Ed	1985
647.94 MASS	Math & Science Competencies in Hotel & Lodging MA/DOE, Division of Occupational Education	1986
658.8 MASS	Math & Science Competencies in General Merchandising MA/DOE, Division of Occupational Education	1986

E. SOFTWARE APPLICATIONS

Title	Vendor	Description
Science Tool kit .....Module 1 .....Module 2 .....Module 3	Broderbund	Simulation and experimentation Computer acts as research laboratory in speed, motion, temperature, light, plus human circulatory, nervous, and respiratory systems. Earthquake seismograph included. Joystick required.
Planetarium : on Computer The Solar System	Focus Media	Simulation, problem solving. Student can view the solar system from various perspectives as well as calculate weights and ages of different planets.

Title	Vendor	Description
Car Builder	Weekly Reader Family Software	Design and measurement. Students design car using principles of mechanics for chassis, engine, suspension systems. Model can be wind tunnel and track tested.
The Human Body: An Overview	Brainbank	Simulation, tutorial. Students can view muscular, digestive, respiratory, skeletal, nervous and circulatory systems while following text presentation.
The Skeletal System	Brainbank	Simulation, tutorial. Program introduces skeletal system, bones, joints, ligaments, and cartilage showing how they fit together.
Drugs: Their Effects on You	Marshware	Tutorial. Students learn about commonly used drugs and their positive and harmful effects. Program provides discussion topics about drugs in society as well as comprehensive quiz material.
Temperature Plotter	Vernier Software	Experimentation. Allows students to measure four temperatures at a time. Range: -20 to 120° C. Includes probe system.
Physics .....Acceleration .....Circular Motion .....Free Fall .....Gas Laws .....Heat .....Momentum .....Newton's Laws .....Projectiles .....Waves	J & S Software	Demonstration. High resolution picture of graphs, charts, and lab setups.
The Scholastic Inquiry Approach Science	Scholastic Software	Simulation, research. Students are provided with databases of facts to that they manipulate and analyze to form hypotheses about weather and climate (AppleWorks required) and physical and life sciences (pfs file/ report required).

Title	Vendor	Description
Operation Frog	Scholastic Software	Simulation. Allows student to dissect and examine the makeup of a frog. Also allows the "reconstruction" of the frog.
Cardiovascular Fitness Lab	HRM Software	Tool. Interactive program can be used to make actual measurements of human heart functions.
Biofeedback Microlab	HRM Software	Tool. Students can collect and report data gathered from themselves and how they react to stress, thoughts, feelings.
Earth Chemistry	Queue Tutorial.	Basic concepts in chemistry — atoms, molecules, compounds, mixtures, and properties of matter.
The Earth's Water	Queue Tutorial.	Students will learn about the water cycle.
Science Literacy: The Lio Project & The Lortep Project	Looking Glass	Simulation. Students are required to design a system that will allow new organisms to grow and survive. Time is the year 2015 when the earth is running out of fuel.
Weather and Climate Lab	Scholastic Software	Tool. Uses real data from NOAA to predict local and national weather.
The Voyage	Sunburst	Tutorial, tool. With use of videotapes of the Mimi and software, students explore eco-systems, maps and navigation, whales, the environment, and computing.

SOCIAL STUDIES REPORT

A. OVERVIEW

The teaching of history and government has been the traditional focus of the comprehensive and vocational technical schools' social studies programs. It is the feeling of the Social Studies Cluster Participants that while these subjects are critical for citizen preparation and the teaching of them should be strengthened, the high school social studies program must contain sciences and humanities with history serving as the unifying force. Students cannot understand United States history and government fully without first gaining knowledge of world history and cultures, including Eastern and African traditions which are not often studied. Students must know how the collisions of cultures during the history of the world have contributed to the present world. In addition, geography, political science, law, economics, and the behavioral sciences should be interwoven into the teaching of history, and with each other, as well as taught as separate disciplines that contain a wealth of valuable information worthy of intensive study. Beyond gaining a fuller appreciation of the past, students need to be aware of the enormous extent of global interdependence in the world at present. They need to learn how decisions made in this and other countries have influenced people in other countries and their own.

In order to accomplish this, the teaching of social studies must include learning about social and global problems. Instruction in all disciplines must provide the knowledge necessary for students to be able to conduct thorough analyses of problems. Instruction should be interactive and utilize a variety of teaching strategies, as well as relate the past with present events whenever possible. Students should gain a strong understanding of cultures and people, events and developments, philosophies and documents which have contributed to the present stage of the world's development.

Obviously, the knowledge students need to gain cannot be learned in one year. Students should be encouraged to engage in intensive study of the social studies disciplines as well as the study of world history and cultures, United States and Massachusetts history that includes teaching of recent history, and national, state and local government. It is through such a comprehensive coordinated program at the high school level that students will be best prepared for their role as citizens.

The findings and recommendations of the social studies cluster endorse the principles advocated by the Massachusetts Council for the Social Studies in their 1988 report entitled "Excellence in Social Studies Education: The Foundation of Active Citizenship." In summary those principles can be described as follows:

- The teaching of social studies is important, basic and essential within the total curriculum at all levels and all grades.

- The teaching of social studies is complex, requiring specialized knowledge from many fields and necessitating a variety of teaching strategies and methodologies.

- The overriding reason for incorporating social studies within the curriculum is to assist students in becoming knowledgeable, skilled and sensitive to their democratic heritage and civic responsibility.

- The debate on what social studies should be taught to whom is best engaged at the local level so that the eventual design may parallel local resources, community and/or regional needs.

- In view of the valid cause for concern and needed prioritization of academic pursuits, there are exemplary teaching practices occurring within social studies classrooms and they provide effective models for those involved in curriculum review.

B. IMPLEMENTATION ISSUES

1. Strengthening Requirements

In most State requirements for high school graduation, a choice is offered between history on the one hand and courses in social science and contemporary social issues on the other. From the observation of social studies participants of the Model Academic Project many high school students, even those in the academic track of comprehensive high schools, take only one history course. Students enroll in honors courses in history at less than half the rate they enroll for honors courses in English and Science. Typically, requirements have also declined in writing essays, producing research-based papers, and reading original sources. Yet these learning activities provide excellent opportunities to reinforce the very basic skills so sorely needed by today's workers. Similar declines are reported in the requirements for such reasoning skills as evaluating sources of information, drawing conclusions, and constructing logical arguments.

The decline in the study of history may hinder students from gaining an historical perspective on contemporary life. In an attempt to halt this decline, it is the recommendation of cluster participants that individual schools strengthen history requirements beyond the mandatory State requirement of one year of American History.

2. Textbooks

We recommend that the curriculum be developed to encourage the design of courses that go beyond textbooks and offer other reading materials to include controversial issues and multiple and different points of view of historical interpretation.

A single text should not be central to the curriculum. Instead, materials need to be selected which allow for an in-depth coverage of each topic, as well as a focus on current history such as the Vietnam Conflict, the Cold War and the nuclear arms race in U.S. History. These topics cannot be covered with any depth and have often been neglected or even omitted in courses that follow a textbound approach.

This textbook issue is the major issue in social studies education. The "breadth vs. depth" debate is perhaps the most problematic in the progression and content of American History courses in particular. Teachers were too often bound to the coverage of the text. The new trend is to adopt a "post-hole approach"- find a good topic and dig deep - rather than trying to cover everything in a cursory way, as is the case in a typical survey course. The outline approach can help dislodge the influence of social studies courses. Model Academic Project felt that we need to empower teachers to make decisions on the selection of materials appropriate for their students level of interest and performance.

3. Application of Concepts

Students learn more from how they are taught than by what they are taught. If they understand that multicultural activities are embraced, not only in social studies classes, but in the school itself, then they will understand its importance. If they observe that constitutional rights are upheld, that teachers and students have the opportunity - and seize it - to speak out against injustice in the school and immediate community, then they will understand the concept when it is studied through the social studies program. More than at any other level, attitudes of high school students are formulated by how they live rather than what they are told. When they are allowed to practice the concepts that are contained in the social studies program, both inside and outside of the classroom, then they will be better prepared to assume the responsibilities of citizens when they graduate.

Social studies teachers offered support for curriculum, and learning experiences which addressed a solid explanation of the laws with facts from civics and commercially designed textbooks and hope students see themselves as members within the community. Teachers offered support for law-related educational activities. Effective law-related education programs teach students to become law-abiding, contributing citizens by bringing law to life within the classroom setting. Such instructions provide students with a clear understanding of their legal rights and responsibilities and with the skill to avoid and, better yet, to mediate disputes. Law-related education also establishes a sense of justice among students which is critical for participation in an informed democratic society.

In the "Facing History and Ourselves: Holocaust and Human Behavior" curriculum, students investigate the use and abuse of power, obedience, loyalty, decision making and survival as they further develop their notions of justice. The "Facing History and Ourselves" curriculum provides the learner with a sensitivity of the importance of current issues and a lens in which to examine those issues.

Classroom learning which combats and reduces adolescent prejudice is an important component of any viable social studies program. The "Facing History and Ourselves" curriculum expands student level of awareness of justice issues. It demonstrates that public education can involve students and faculties with the origins, growth and consequences of racism and methods to draw parallels to racism within our society, our schools and our neighborhoods.

Social studies curriculum should also be closely tied to the real problems students will face as adolescents and in their adult lives. The challenge of learning must be genuine. Students need the opportunity to apply knowledge to their own experiences, to re-examine their priorities and their relationships with others. Curriculum which raises issues with concerns to daily lives provides opportunity for self reflection and encourages students to practice thinking about how their contribution to society makes a difference, and it has impact.

C. CURRICULUM OFFERINGS: CONTENT AND PROGRESSION

After careful deliberations and a thorough review of several reports, the social studies cluster extends the following recommendations:

- Social Studies courses should be offered to vocational technical students during each of their four years of education.
- A course should be offered in the freshman year to assure basic skills in:
  a. Geography, i.e., map skills, major political divisions and physical locations of the United States and the world.

b. U.S. Government, i.e., the study of American political behavior on the local, state and national levels.

c. Law, i.e., the study of the U.S. Constitution, the Massachusetts' State Constitution and the administration and function of the legal system.

- A course in Global/Area studies should be offered in the sophomore year to include a study of the history and culture of Western Europe, the Soviet Union, Africa, the Middle East, Southeast Asia and Central and South America.
- A U. S. History course should be offered preferably during the junior year. In order to insure in-depth study and breath of coverage, this course should be the equivalent of 1/2 of a Carnegie unit, i.e. 180 days of 40 minute periods or double periods for 90 days of 40 minute periods.
- A course in Human Relations/ Human Behavior/Social Psychology be offered in the senior year.

Social Studies Courses

201	U.S./ American History	Historical survey of U.S. domestic and foreign affairs
202	European History	History and culture of particular European nations
203	Survey of Western World History	Culture and political survey, (World Geography and World ancient and modern western Culture, History of World civilization Civilization)
204	Survey of Ancient world History (Ancient World History, Early World History)	Ancient civilization; Africa, Asia and Middle East; Cultural Development of Civilization, and artistic contributions
205	History, Special Topics (Twentieth Century America Westward Movement, Civil War, Mexican History)	Study of particular historical periods or themes
206	Social Science (Psychology, Economics, Sociology, Anthropology)	Study of behavior and organizations of people
207	Area Studies (Asian Studies, Latin American Studies, African Studies, Afro-American Studies)	Study of the history, society politics, culture and economics of a particular geographic subset of the population

208	Government and Law Civics, State and Local and American Government)	Study of the description and analysis of political and legal institutions and processes

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E. SOFTWARE APPLICATIONS

Title	Vendor	Description
Maps and Globes	Micro-ed	Drill and practice has student book
Where in the .....World .....U.S.A. .....Europe is Carmen San Diego	Broderbund	Educational game. Student tries to find master thieves using clues from game and World Almanac Book of Facts. Best suited for cooperative education
"And if Elected....."	Focus Media	Political simulation. Student must Re-resolve 12 crises to win second term
The U. S. Constitution Nationalism and Federalism	Focus Media	Role-playing activities resolve 12 crises to win second debates at the Constitutional Convention.

Title	Vendor	Description
Decisions, Decisions. .....Colonization .....Revolutionary War .....Immigration.. .....Urbanization .....Foreign Policy .....Television .....The Budget Process .....On the Campaign Trail	Tom Snyder Productions	Simulation. Students are presented with situations like those faced before in American history. Consequences of students' decisions are recorded by the computer
The Other Side	Tom Snyder Productions	Simulation. Students must find a way of achieving peaceful coexistence balancing economy, military and national security.
Crosscountry USA	Didatech Software	Simulation. Students must become acquainted with U. S. cities, landmarks, industries as they deliver goods around the country.
The Great Knowledge Race: U. S. History	Focus Media	Game. Students compete in group or as a class with topics drawn from database of U. S. history time periods.
The Scholastic Inquiry Approach to Social Studies	Scholastic Software	Simulation, research. Using AppleWorks or pfs: file/report, students examine databases to look for trends in U. S. history, government, Congress, Constitution, and World geography culture, and economics.
Oregon Trail	MECC	Simulation. Realistic historical simulation of westward migration in U. S. history.
World Atlas Action	DLM Teaching Resources	Tutorial. Program teaches locations and facts about countries, regions, continents.
European Nations & Locations	Designware	Tutorial. Teaches facts about countries, cities, geographic formations, waterways.
Africa	Educational Activities	Tutorial. Teaches facts about countries, cities and branching for extra review.

Title	Vendor	Description
Ancient Civilizations	Focus Media	Drill and practice with game. Major focus in Mediterranean area, Greek and Roman empires.

COMPUTER EDUCATION/LITERACY REPORT

I. OVERVIEW

Over the past twenty years, computers have become evident in the lives of most, if not all, United States citizens. Innovations such as automatic teller machines, supermarket Universal Product Code (UPC) scanners, video games, computerized automobile dashboards and telephone answering services are all examples of how technology has changed everyday living in the U.S. With computers becoming so prevalent in our society, it is essential that everyone have some knowledge of how computers work.

In the early 1970's, a group of pioneers in educational uses of computers met at Dartmouth College to discuss the concept of computer literacy. It was agreed among the group that every citizen of the United States must have an understanding of computers. They recommended to the Federal Government that a required computer literacy course be developed and implemented into the junior high school curriculum. In the 1970's, this recommendation was not taken very seriously. Today however, the issue of computer literacy in education is being considered with much seriousness.

All students can benefit from computers since they can be used as a powerful tool to enhance learning. Faculty members at the University of Michigan have found that students who supplemented their education with computers learn more, do better on tests and achieve better overall grades. In addition, such usage in the classroom aided in developing students' self-esteem. When implementing a computer literacy program in vocational technical high school's academic curriculum , educators must be particularly certain to utilize programs which are consistent with the overall occupational goals and career paths of the student.

Many vocational technical students, whatever program they specialize in, may enter the world of entrepreneurship after completing their vocational technical training. In today's society, computers play an important role in any business for efficient information processing, accuracy, accessibility and reproduction; thus, making the occupational and career implications of computers an important area to be addressed in vocational technical curriculum development.

Many vocational technical educators strongly believe that prior to graduation, all students should be required to master a basic core of skills in using computers. Regardless of the few difficulties in implementing this requirement, which may stem from limited funding, lack of uniform teacher training, certification and approval and the struggle to offer additional learning within the time available within the academic curriculum, such a requirement would be extremely beneficial to students, educators, administrators, and society alike.

B. IMPLEMENTATION ISSUES

In order to take full advantage of the rapid technological changes occurring in society today, computer literacy is necessary. Used properly, computers can help tailor instruction for individual students or small groups, increase student participation and simulate experiences outside the realm of books and overcome narrow subject specialization.

Today's generation of students has grown up with television, electronic calculators, computerized arcade games and countless other gadgets that employ electronics and logic similar to computers. It seems whenever working with computers is involved, students have endless energy and enthusiasm. Student participation seems to increase with the use of computers in academic learning as well since students feel a sense of self-satisfaction by being able to manipulate the highly technological machine.

Most participants of the Model Academic Project recognized the need to develop strategies to incorporate and integrate computer literacy learning activities within their classrooms. Many participants select professional improvement opportunities which promote computer technology as a perpetually changing and improving concept. In most cases, investment comes with improvement; and implementing a computer literacy program into the vocational technical curriculum is not an exception. The investment involved, however, can be insignificant when compared to its educational gains.

The early progress of many secondary schools in the area of educational technology was due to the generous financing of the school department and the private sector. Although there are numerous funding scenarios, the ideal combination would be a partnership between the school, communities, state, federal government and the private sector. It is believed that to realize full potential of the technology in the U.S.—to develop learning geared to each student—will require the commitment, effort and cooperation of all segments of society. Many vocational technical high schools utilized Equal Education Opportunity (EEOG) state grants to provide funding for computer instruction. Others obtained private sector support via foundations and corporate gifts.

Teachers in all subject areas, including the vocational technical areas, should recognize and take advantage of the computer as a powerful and concrete device for teaching critical thinking and problem-solving skills. Of course the use of computers in education will require many hours of teacher training which must be administered by a staff of competent computer educators.

According to the Congressional Office of Technology Assessment (OTA), computers and other advanced technologies can spur major improvements in education, but "educational technologies are not self-implementing, and they do not replace the teacher." The problems lie in the teacher's competency to teach with computers and where to find the resources and time required for teacher training/certification/approval.

The OTA stated in a new report, "Power On! New tools for Teaching and Learning", that only about one third of U.S. teachers have had even 10 hours of computer training, most of which is devoted to learning about computers rather than how to teach with them.

Many teachers are either too resistant to change or afraid, since they lack extensive computer training, to use computers in the classroom. Research has shown that a teacher's attitude towards computers directly affects students' attitudes as well. One way to improve a teacher's attitude towards computers can be by providing adequate computer training; however, teachers must also realize that computer instruction is not just for the benefit of the student. By using computers, teachers gain greater access to information and more varied learning resources to improve the way students learn. The use of computers will also boost teacher efficiency by reducing paperwork and repetition of instruction, and increasing the timely flow of information.

The OTA also suggests that every school have at least one individual or team of experts on hardware and software responsible for teacher support with computers. This individual or support group would assist in training teachers and administrators on computers, make recommendations regarding hardware and software, purchasing decisions and help individualize computer software for a particular program.

The Annual Professional Development Conference in Massachusetts , hosted at Westfield State College, provides computer training workshops for those vocational technical educators who desire computer training. These computer training workshops need not be in the traditional scheduled academic and vocational technical workshops. During the 1989 Professional Development Conference, many vocational technical teachers, in both academic and vocational technical areas, expressed much interest in a required computer literacy course for all students. Apparently, the problem with such a requirement stems from the lack of available time in the academic curriculum. Therefore, a reconfiguration of the academic course requirements is needed to accommodate this critical program.

Lastly, with computers becoming so widespread, many students may already have learned the computer skills, concepts and facts covered in the computer awareness course before entering the classroom. What is needed in this case is a complex, tamper-proof testing program which will allow students to demonstrate those things by passing a test or set of tests which certify their learning. This type of system can exist in conjunction with regular instructional programs, so that those who cannot "test out" will still be able to obtain credit, but those who can are not delayed.

Vocational technical administrators, instructors and support staff and educators need to evaluate their school curriculum to decide where computer instruction will be most beneficial given the resources available. Model academic Project contributors suggest the curriculum designer keep in mind, however, that vocational students will be especially receptive to the technology if computer instruction is consistent with her/his educational and career intentions.

C. CURRICULUM OFFERING: CONTENT AND PROGRESSION

Suggested Computer Awareness Course Contents

There are many components which could make up a computer literacy course. According to a 1985 Report on "Computers in Education" compiled by staff members of the

California State Department of Education, a computer literacy course should give special attention to the computer itself, its history, how it works, how it can be used to perform useful tasks, and a discussion of the need to protect against misuses of the computer. The potential career implications of the computer also need to be considered.

As part the Model Academic Project, interviews were conducted with various computer-associated personnel. Although the interviews were not as extensive as originally anticipated, the results were combined to propose a suggested computer awareness course.

There seems to exist a consistency between the views of the interview subjects. Although there are slight variations in the actual course contents of each subject, all believe that computer awareness is essential for all vocational technical students, and their recommendations for the basic course outline are the same. All the interviewees believed that the course should contain two basic components, background information and hands-on lab experimentation, with the latter constituting the larger portion of the course.

The background information portion of the course should contain issues such as: the history and evolution of the computer, and computer concepts and terminology, i.e., software, hardware, types of computers. Contributors mentioned that discussions of social issues, such as how computers affect our society, pros and cons of computers, computer ethics, and the use of computers in business, are important elements of an awareness course.

As mentioned previously, hands-on exploration was viewed as essential in a computer awareness course and should make up the majority of the course. The importance of word processing, spreadsheets and databases should also be taught. As an option, BASIC programming should be offered to give students a better understanding of how programs work.

The following is an outline of a computer literacy/applications course curriculum for both students as well as teachers. The core of this curriculum was written and administered by Darryl K. Tyburski , a vocational technical high school graduate, instructor and a Westfield State College degree candidate within the computer and information science program.

Course Description

The course is designed to teach participants the effective uses of the microcomputer as a tool for managing information effectively and easily. It will focus on the three most common information managing tools of the microcomputer — the spreadsheet, the database manager, and the word processor. The major emphasis of the course focuses upon how a student, teacher, or administrator can use a computer to help leverage their time, and thereby increase their personal productivity and efficiency. Many ideas for using these tools in the classroom and workplace will be explored and discussed. This is not a programming course and will focus exclusively on learning how to use prepared software effectively. No prior computer experience is required for this course. The overall goal is to help educators explore the potential of the microcomputer as a practical tool in diverse educational settings and to establish a level of competence amongst students and teachers for the effective utilization of the microcomputer.

Student Objectives

1. To provide students with an increased awareness and understanding of the microcomputer and its applications and implications in education.

2. To provide students with strategies for integrating the microcomputer with their teaching practice and curriculum.

3. To provide students with a hands-on opportunity to experience and assess the potential effectiveness of the microcomputer tools, such as word processing, databases and spreadsheets.

4. To produce useful occupational software applications and explore current research related to the business use of word processing, databases and spreadsheets.

Course Outline

I. Computer Technology in Our Society

A. What is the Society's Perception?

1. Computer Assisted Instruction
2. Application Software for Business
3. Telecommunication Resource
4. Computer Programming
5. Entertainment

B. What Should the Vocational/Technical Student's Perception Be?

1. A versatile tool that expands user's ability to present information in dynamic ways
2. The computer should not be a separate discipline unto itself
3. A time leveraging and management tool for education and business.

II. How Can Vocational Technical Students Use Computer Technology to Become More Productive, Efficient, and Effective?

A. What are the information processing needs of business?
B. What are the capabilities of the computer?
C. Can a Computer Meet My Information/Handling Needs?

III. Basic Operations and Maintenance of the Computer

A. Hardware Components

1. History of microcomputers
2. Modern microcomputers
3. Future trends in microcomputers
4. Parts of a computer system
5. Care and maintenance
6. Starting the computer

B. Software Components
  1. Disk Operating Systems
  2. Loading and running the computer
  3. Formatting diskettes to receive data
  4. Accessing the disk directory
  5. Backing up and protecting the diskettes
  6. Care and maintenance

IV. What is integrated software and why is it so popular and easy to use?

V. The Electronic Database
  A. What is an electronic database
  B. How can it be useful to educators?
  C. How do you use one?

VI. The Word Processor
  A. What is word processing?
  B. How can it be useful to educators?
  C. How do you use one?

VII. The Electronic Spreadsheet
  A. What is an electronic spreadsheet?
  B. How can it be useful to educators?
  C. How do you use one?

VIII. Other Electronic Tools
  A. Statistical graphing software
  B. Spelling checkers
  C. Grammar/style checkers

IX. Using Application Tools in the World of Work

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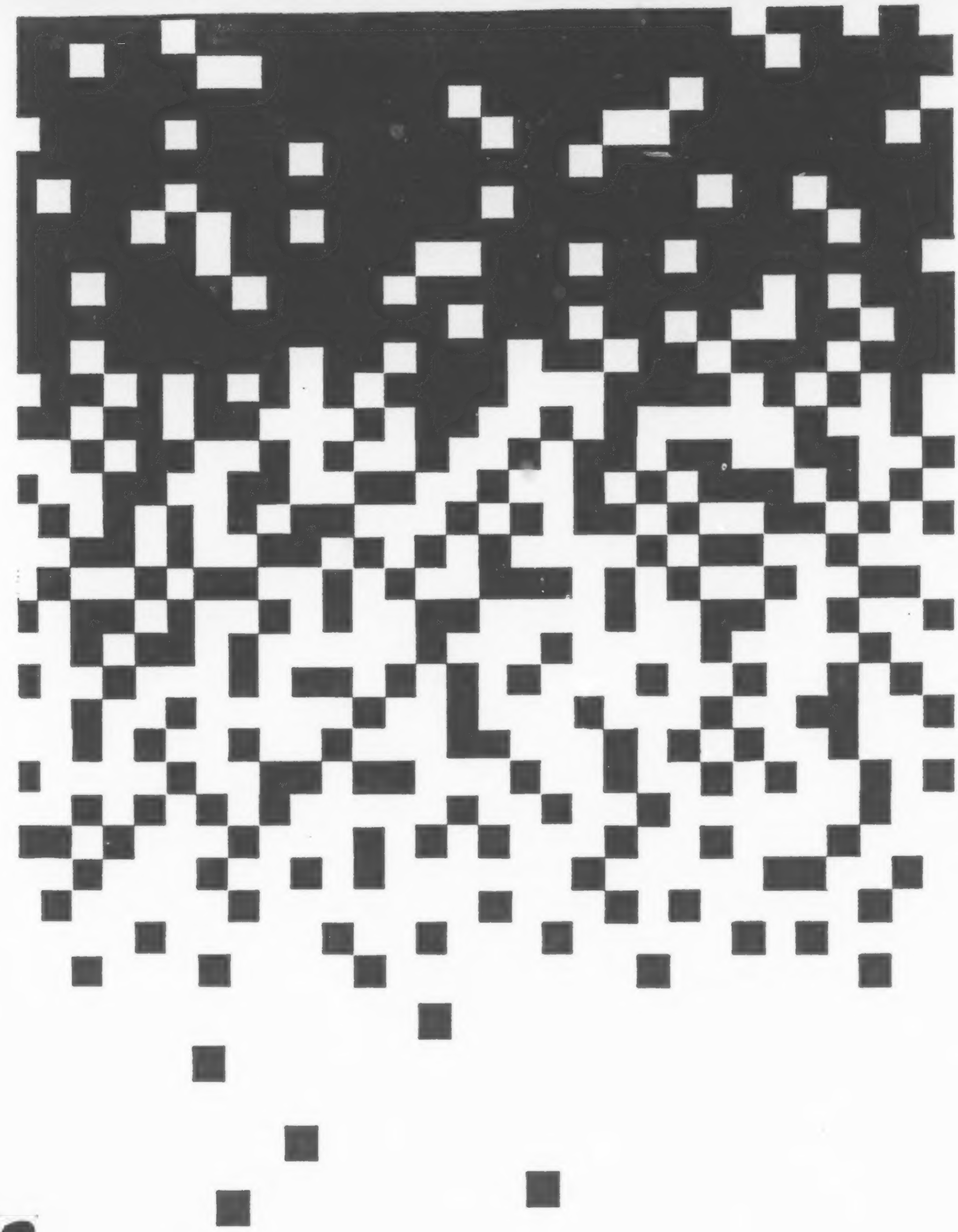
EQUITY STATEMENT

In the creation and implementation of any curriculum, textbooks and ancillary materials serve an important function in helping students to understand and internalize critical concepts. Given the prominent role of these teaching tools, the model academic project participants wish to emphasize the need for all materials to be thoroughly reviewed for sex/ethnic fairness and to refrain from using materials containing gender discrimination and stereotypical characterizations as required under Title IX and Chapter 622.

It is the responsibility of educators to impart the concept and practice of equity to students by daily example.

(continued on page 78)



Results of the 1989 Existing Course Pattern Survey

Educators must underscore and reinforce the teaching of this concept by ensuring the elimination of all biases and stereotypes (sexual, ethnic, racial and religious), both verbally and graphically , implicitly and explicitly, from all teaching aids to which students are exposed. Only in this way will vocational technical education be free of all forms of discriminatory behavior to enable students to be more respectful and tolerant of individual differences.

VIII. RESULTS OF THE 1989 EXISTING COURSE PATTERN SURVEY

The Model Academic Project conducted a survey of all Massachusetts secondary vocational technical schools operating five or more Chapter 74 programs. The major purpose of the survey was to gather information about academic courses offered to vocational technical students as part of their overall program of studies. Prior to the use of the survey, it was already known that there would be considerable variance regarding the range, scope, and level of academic course offerings according to the type of secondary vocational technical school. Results from data about existing academic course patterns formed the basis for recommendations about the range and scope of academic course offerings which should be considered by administrators of the Commonwealth's secondary vocational technical institutions.

The study team solicited recommendations for the design of the statewide survey instrument from the project's advisory group and from several professional staff of the state's vocational technical schools. Several key variables were taken into account in the design of the overall survey instrument including:

- type of vocational/technical institution
- content categories
- grade level
- amount of credit award
- ability grouping
- reinforcement of vocational and technical learning
- the level of preparation provided by the courses

The study team determined that the survey would be used to gather information about five clusters of academic course offerings spanning several content domains. These were: (1) mathematics; (2) science; (3) English; (4) social studies; and, (5) other (business, computer, arts, foreign language, and health and fitness). The biggest challenge in the design of the survey was to establish course offerings with generic labels to enable respondents in the various vocational technical schools to identify listed course options while assuring that names were still specific enough to convey a clear and consistent meaning. By soliciting feedback during the survey design stage, the study team was able to identify some 109 generic course titles for the five content clusters. While it was believed that these 109 course titles represented the approximate range of courses offered by the state's vocational technical institutions, the study team provided a means to gather information about other courses that might fall outside of the standard course titles. At the end of each cluster of academic sections (i.e., English, social studies, math, science or other) several blanks were left for the survey respondents of individual schools to enter additional courses which they offer within respective subject/content categories. The resulting survey instrument provided space for up to 100 additional course titles.

To minimize respondent confusion over various course titles or how to complete different sections on the survey instrument, the study team developed a guide to help each respondent complete the forms. There were specific directions for each section of the survey, definitions of terms, as well as guidelines for deciding among listed options. This step led to more consistency across responses, and, therefore, greater reliability within the resulting data. Report reviewers should note that data tabulations for certain sections, particularly the course taking patterns component, were analyzed in terms of frequency rank percentages and they do not compute to standard 100% totals. This approach was necessitated since survey respondents were permitted to select more than one response in several situations. In such cases the conclusions and comparisons drawn should be considered as references and pattern indicators of the designed academic learning activities.

The study team also took steps to assure that the appearance of the survey instrument would support a high rate of return. It was designed to present a clear layout in order to minimize respondent confusion and errors. The design called for sufficient spacing to make it easy for respondents to enter data. To expediate the process of completing the survey, it was prepared so that responses could easily be entered on a standard machine readable form. Further, a customized National Computer System Trans-optic form was typeset for the survey complete with variable labels and directions. Blank fields were left so that different course titles could be printed on a single generic survey form.

A sample page of this form appears as Appendix F in this report. The actual survey questionaire consisted of ten pages of course titles and ten pages of blank forms for respondents to enter additional courses.

Beyond the obvious advantages of appearance and ease of response, the use of optical scan response forms was important to the data analysis process. The Westfield State College Computer Center was able to quickly scan survey responses and run statistical analyses on the computer according to the needs of the study team. This proved to save considerable time in the analysis process.

The analysis plan was straightforward and uncomplicated. The study team was interested in the distribution of the range and scope of course offerings across all vocational technical schools and within the various categories of vocational technical institutions. Consequently, the analysis procedures concentrated on calculating distribution statistics including frequencies, percentages within categories and the cross-tabulation of individual survey variables. To display the survey findings we have prepared three types of tables. The first set of tables presents survey summaries across all vocational technical institutions by both subject area content categories and institution type. The second set of tables displays summary data by content category for each type of vocational institution. The third set of tables is more detailed, consisting of actual frequencies of specific course offerings across grade levels of different types of vocational technical schools.

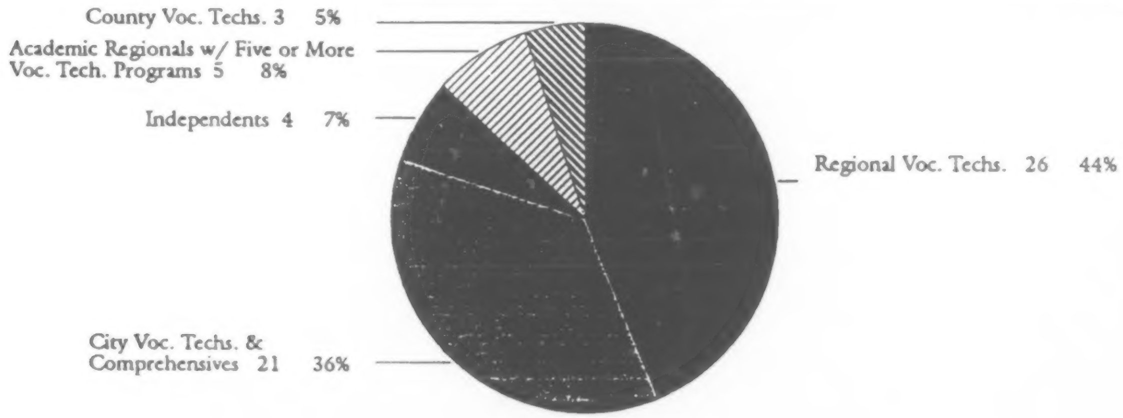
Table 1

Comparisons of Course Taking Patterns in Vocational Technical Schools by Subject Content Category (percents)

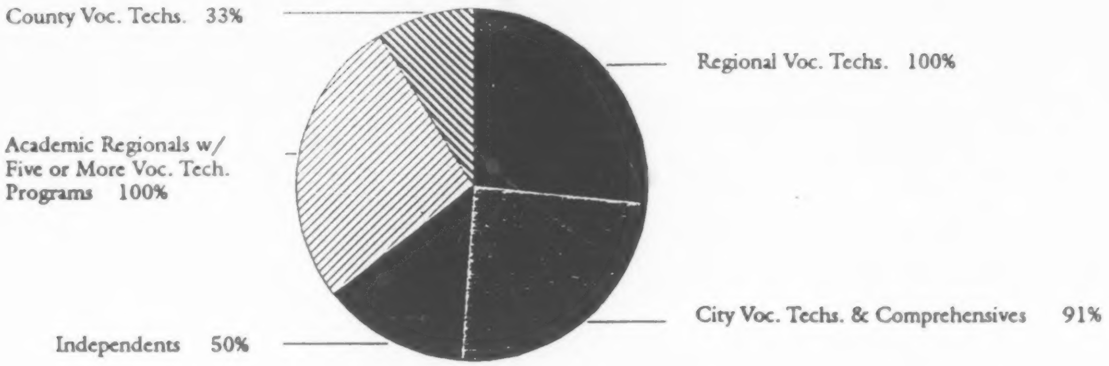
	Gender			Course Weight in Credits				Ability Grouping		Course Taking Patterns				
Course	M	F	B	<.5	.5	1.0	>1.0	Yes	No	4yr	2yr	Emp	Rem	Oth
Math	7.7	3.3	89.0	1.4	38.8	59.5	0.3	78.2	35.1	7.7	50.0	45.6	22.7	10.3
Science	10.8	5.2	85.9	2.1	53.3	40.8	3.8	57.2	39.2	11.5	47.3	49.8	12.6	12.2
English	12.7	4.3	82.9	3.6	35.2	57.3	3.9	69.7	44.5	10.1	48.8	72.0	30.6	11.6
Social Studies	5.9	0	94.1	0	37.5	53.0	9.5	49.4	39.6	7.5	44.4	56.6	15.0	14.0
Business/ Comp./ Other	7.7	8.5	83.9	23.4	43.7	31.4	1.6	24.2	36.9	1.6	20.0	44.3	4.5	28.9
All	8.6	5.1	86.3	9.9	43.4	44.2	1.2	63.6	36.4	6.4	38.1	51.8	15.6	17.7
% of Total										5	29	40	12	14

Table 1 is the summary of all survey responses (53 of the 59 mailed were completed) by subject content category. The responses of all vocational technical schools represent a total course frequency of 1741 across content areas. In mathematics some 376 courses were identified by the total pool of respondents. Likewise, there were 245 courses identified in science, 328 in English, 171 in social studies, and 621 in the "other" category. The second three columns in the table display percentages of courses that tend to be weighted toward either males or females or are balanced. Across all subject content categories the courses are overwhelmingly balanced with an overall percentage of 86.3% of the 1741 courses being rated as balanced.

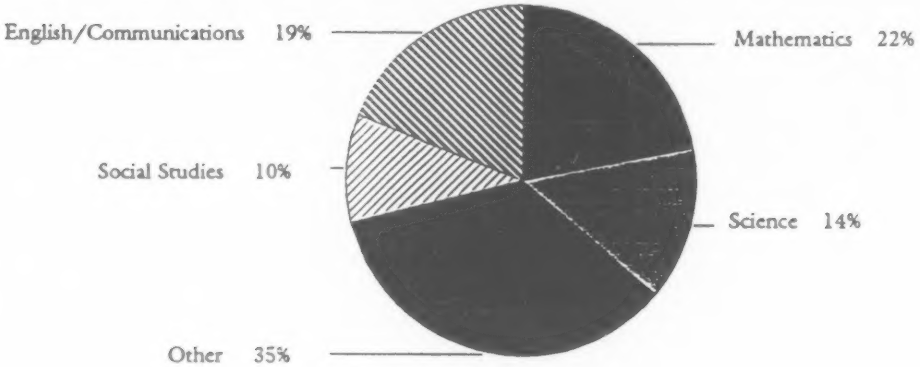
Massachusetts Secondary Vocational Education Delivery System Based upon Fall 1989 DOE Data



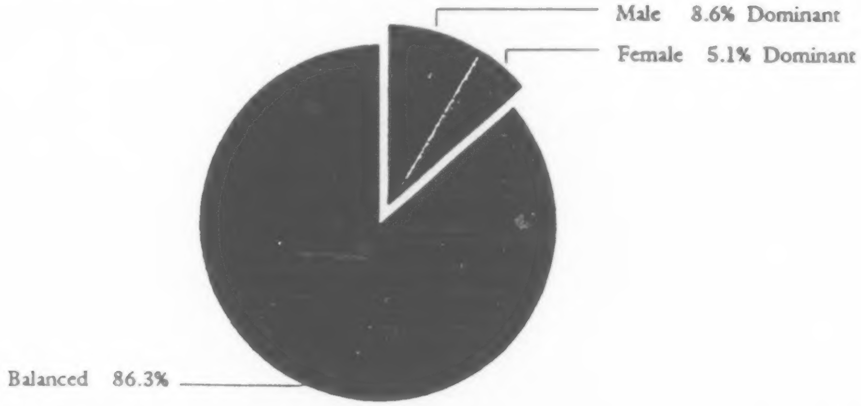
Survey Response



1989 Academic Course Offerings of Massachusetts Vocational Technical Schools

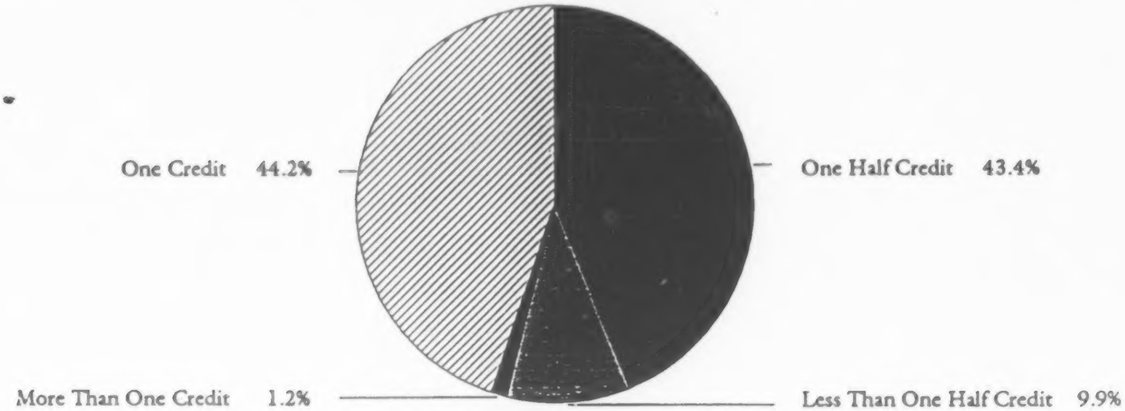


Percent of Courses Showing Gender Weighting



The third set of columns in Table 1 display relative course weights (amount of credit awarded for the course). As can be noted from these data, across all subject content categories relatively few courses are awarded either less than one half credit (9.9) or more than one full credit (1.2). The highest number of courses are offered for one full credit (44.2%) and a similar proportion of courses is offered for a half credit (43.4). For mathematics, English, and history over 50% of the courses are offered for one credit. For science 53.3% of the courses are offered for one half credit.

Percent of Course Weight in Credits



With the exception of the "other" category, the predominant pattern across the content areas is to group students according to ability level. This was particularly true for mathematics (78.2%) and English (69.7) while the overall proportion of courses including "other" was at 63.6%. Although it is not displayed in Table 1, survey respondents indicated that some 44.5% of the 1741 courses were rated as reinforcing vocational technical learning. The last five columns in Table 1 display summary data on the relative level of preparation provided by the course offerings. Across all content categories some 51.8% of the courses are intended to prepare students for employment; 44.5% were intended as preparation for a two or four year post-secondary education; and 5.6% were remediation. Please note that in several cases survey respondents felt that courses were intended to provide students with more than one career path option and this necessitated proportional adjustments to reflect percentage style reporting. The 93% successful placement record, within direct or related occupations, of the Massachusetts Vocational Technical school graduates provides impressive evidence of the quality of their academic training.

Table 2

Comparisons of Course Taking Patterns across All Subject Areas by Type of School(percents)

	Gender			Course Weight in Credits				Ability Grouping		Course Taking Patterns				
School	M	F	B	<.5	.5	1.0	>1.0	Yes	No	4yr	2yr	Emp	Rem	Oth
Comp. and Reg. HS	2.5	1.6	95.9	7.1	14.5	76.4	2.1	62.1	44.1	27.4	57.2	48.5	23.1	21.3
Regional Voc. HS	4.0	2.3	93.7	12.3	53.8	32.2	1.8	47.9	48.8	4.9	32.2	49.0	12.6	20.4
City/Town VocTech. HS	17.1	3.8	79.0	6.3	31.6	60.2	1.9	47.2	46.7	11.8	48.9	65.2	7.7	5.0
County	—	—	100	-	20.0	80.0	-	96.3	9.3	-	59.3	81.5	51.9	33.3
Indep.	-	60.7	39.3	19.6	78.4	2.0	+	85.2	12.0	-	41.4	56.9	22.4	25.9
All	8.0	4.7	87.2	9.7	40.2	48.0	2.1	68.7	32.2	10.3	41.0	51.8	15.6	17.7
% of Total										8	30	38	11	13

Table 2 presents similar data summaries to those in Table 1, but the summary is on the basis of the type of vocational technical institution rather than the subject content categories. As can be noted in the table, the majority of courses are balanced rather than intended for either males or females across the different types of institutions. This is particularly true for both Comprehensive High Schools (95.9%) and Regional Vocational High Schools (93.7%). The exception to this pattern appears to be with Independent vocational technical schools who show only 39.3% balanced courses. This may be a function of the small number of Independent schools in the study.

As was the case when viewing all vocational technical schools together across content categories, the pattern of course weightings by institution type is concentrated on either courses where one full credit is awarded (48.0%) or courses where one-half credit is awarded (40.2%). Again, there are relatively few cases where either more than one credit or less than one-half credit is awarded. However, there is some variance among types of institution regarding the amount of credit awarded. Both Regional vocational high schools and independent vocational technical schools award one-half credit for the majority of their courses. For the other types of institutions, the majority of courses carry a one full credit weighting.

Regarding ability grouping, there are some differences among the various types of institutions. Regional vocational high schools, city/town vocational high schools, and regional academic high schools tended to group on ability in fewer than 50% of their courses while the other types of institutions grouped on ability most of the time (range was from 62.1% to 96.3%). There was only slight variance by institution type regarding whether or not the academic courses reinforced vocational technical learning. Comprehensive high schools indicated that some 27.4% of their courses were intended to prepare students for further study in four year post-secondary institutions and over half of their courses were intended for preparation of study at two year post-secondary institutions. Across the other types of institutions there was relatively little variance regarding this variable.

Tables 3-6 display data summaries according to subject area for different types of institutions. Based on the relatively small numbers of different types of institutions, some types were combined in the same table where similarities existed. Table 3 displays data for Comprehensive High Schools only ; Table 4 displays the data for Regional Vocational Technical High Schools only; Table 5 shows data for City/Town Vocational Technical High Schools; and Table 6 shows combined data for Regional Academic High Schools, County Agricultural High Schools, and Independent Vocational Technical High Schools by content category. By comparing across these four tables some different patterns can be noted between the the different types of institutions.

Table 3

Comparisons of Course Taking Patterns in Comprehensive High Schools by Subject Content Category(percents)

	Gender			Course Weight in Credits				Ability Grouping		Course Taking Patterns				
Course	M	F	B	<.5	.5	1.0	>1.0	Yes	No	4yr	2yr	Emp	Rem	Oth
Math	2.6	1.3	96.1	-	4.9	88.9	6.2	86.4	19.8	28.9	51.8	51.8	26.5	11.9
Science	7.5	-	92.5	-	-	100	-	76.7	21.2	59.8	68.8	46.8	24.4	28.8
English	-	-	100	-	17.5	82.5	-	76.8	31.7	37.0	70.4	64.4	35.6	17.8
Social Studies	—	—	100	-	6.2	93.8	+	66.7	26.4	31.4	61.8	58.8	35.3	26.5
Business/ Comp./ Other	2.9	3.6	93.4	20.2	26.9	51.3	1.9	67.0	27.8	12.3	46.5	37.3	12.3	24.7
All	2.5	1.6	95.9	7.1	14.5	76.4	2.1	75.1	24.9	27.4	57.2	48.5	23.1	21.3
% of Total										16	32	27	13	12

Table 4

Comparisons of Course Taking Patterns in Regional Vocational Technical Schools by Subject Content Category(percents)

	Gender		Course Weight in Credits				Course Taking Patterns					
School	M	F	B	<.5	.5	1.0	>1.0	4yr	2yr	Emp	Rem	Oth
Math	2.1	0.8	97.1	1.3	45.0	53.7	-	4.7	44.4	39.2	20.6	10.2
Science	4.6	2.3	93.1	2.3	63.6	31.2	2.9	8.7	47.0	44.3	9.8	10.4
English	3.6	1.2	95.2	5.5	40.9	48.8	4.9	8.1	40.7	61.1	26.2	15.1
Social Studies	-	-	100	13.2	67.9	18.9	-	10.0	38.6	60.5	8.8	15.7
Bus/Comp./ Other	6.6	4.7	88.6	28.7	56.7	13.1	1.6	0.0	8.2	46.2	2.4	26.9

Table 5

Comparisons of Course Taking Patterns in City/Town Vocational Technical Schools by Subject Content Category(percents)

	Gender			Course Weight in Credits			Course Taking Patterns					
Course	M	F	B	<.5	.5	1.0	>1.0	4yr	2yr	Emp	Rem	Oth
Math	23.1	0	76.9	9.5	14.3	73.8	2.3	11.9	59.5	54.8	11.9	0
Science	7.7	7.7	84.6	0	54.2	41.7	4.2	20.8	60.9	83.3	0	0
English	26.7	0	73.3	0	26.5	73.5	0	9.6	42.3	76.9	19.2	2.4
Social Studies	12.0	0	88.0	7.1	57.1	35.7	0	15.4	61.5	50.0	0	0
Bus/Comp./ Other	15.4	0	84.6	10.6	30.3	56.1	3.0	9.1	39.0	62.3	2.6	13.0

Table 6

Comparisons of Course Taking Patterns in Regional Academic, County Agricultural, and Indepedent Vocational Technical Schools by Subject Content Category(percents)

	Gender			Course Weight in Credits			Course Taking Patterns					
Course	M	F	B	<.5	.5	1.0	>1.0	4yr	2yr	Emp	Rem	Oth
Math	26.0	18.0	56.0	0	55.4	64.6	0	6.4	48.3	54.0	36.0	18.0
Science	29.4	35.3	35.3	0	29.4	47.1	23.5	0	23.5	64.7	27.8	0
English	44.2	23.1	32.7	7.8	33.3	51.0	7.8	3.8	69.8	96.4	48.1	1.9
Social Studies	26.1	8.7	65.2	0	20.0	80.0	0	0	57.7	50.0	30.8	7.7
Bus/Comp./ Other	13.4	20.6	66.0	7.5	18.3	63.4	0	3.9	28.2	37.9	1.0	15.5

Comprehensive high schools and regional vocational technical high schools presented the great majority of their courses on a balance gender basis rather than dominance by either males or females. Likewise these two types of institutions tended to show little variance on this variable across the the different content area categories. The other categories of institutions tended to show a slightly higher proportion of courses aimed at either male or female audiences (ranging from 9-35%) while the overall pattern still favored equal representation.

Regarding course weightings, comprehensive high schools demonstrated the least variance with over three quarters of their courses carrying a weight of one full credit. All other types of institutions showed more variance on this dimension. In all other cases the majority of courses were awarded either one credit or one half credit. Regional vocational technical high schools and city/town vocational /technical high schools tended to group on the basis of ability somewhat less often then the other types of institutions regardless of content type. There appears to be little difference among institution types regarding whether or not the courses are intended to reinforce vocational technical learning. The differences regarding the relative level of preparation intended for academic courses offered by the various types of institutions were cited earlier in the discussion of Tables 1 and 2.

Tables 7-10 which follow at the end of this section display the absolute frequencies of responses by the different types of vocational technical institutions by actual course listing. Table 7 presents the course selection frequency by grade level for comprehensive high schools and regional academic programs. Table 8 presents course selection frequencies for regional vocational technical high schools. Table 9 presents course selection frequencies for city/town vocational technical high schools and Table 10 presents course selection frequencies for county and independent vocational technical high schools. In comparing these four tables the reader should note that there are different numbers of institutions in the four summary tables. However, some differences in the range and scope of course offerings can be inferred in spite of the different number of schools in each cluster.

For instance, it is somewhat clear that Comprehensive high schools, regional academic high schools, and regional vocational technical high schools offer a broader range of mathematics courses across grades 9-12 than do the other categories of institutions. This pattern is also true for science, English, social studies, and all of the various content areas in the "other" category. County, independent and city/town vocational/technical high schools offer very few course options that fit in the "other" category (business, computers, arts, foreign language, and health and fitness).

While the above data must be considered with caution as self- reported descriptive information, there are some patterns which should be considered along with other study data and information in the formulation of recommendations for the field. There appears to be some rigidity regarding the award of course credits for courses; the great majority of courses carry either one full credit or one-half credit — regardless of type of institution.. This may mean that there is need for greater flexibility in academic course and non course options for vocational technical students. Another factor appears to be grouping on the basis of ability, which may also tend to limit options for some segments of the overall student population.

Table 7

The Frequency of Course Selection by Grade Level at Comprehensive High Schools and Regional Academic Programs

MATH	GRADE	9	10	11	12
301	Remedial/Basic Math	13	10	6	5
302	Practical/General Math	10	13	8	5
303	Algebra I, Two Year Sequence	7	8	5	2
304	Algebra I, One Year Sequence	11	8	5	3
305	Geometry	1	10	8	6
306	Algebra II	1	5	9	9
307	Pre-Calculus	0	0	0	2
308	Trigonometry	0	0	3	9
309	Calculus	0	0	2	2
310	Business Math	3	7	6	3
311	Special Topics/Statistics	1	1	2	1
312	Other Math Courses	2	6	6	4

SCIENCE	GRADE	9	10	11	12
401	Biology I	3	8	4	2
402	Biology II/Advanced Biology	0	2	3	2
403	Life Science, Special Topics	2	3	2	2
404	Intro to Physical Science	4	1	1	0
405	Advanced Physics	0	0	2	2
406	Physics II	0	0	2	3
407	Chemistry I	2	2	4	3
408	Advanced Chemistry	0	0	1	2
409	Physical Science, Special Topics	2	1	1	1
410	Earth Science	6	3	2	2
411	Earth Enviro. Sci., Spec. Topics	1	2	3	1
412	General Science	4	2	2	1
413	Other Science Courses	2	2	3	2

ENGLISH/COMMUNICATIONS	GRADE	9	10	11	12
101	Freshman English	12	0	0	0
102	Sophomore English	0	13	0	0
103	Junior English	0	0	13	0
104	Senior English	0	0	0	13
105	American Literature	1	2	6	4
106	British Literature	0	2	3	4
107	Composition	3	3	6	6
108	Literature, Special Topics	0	1	4	5
109	Communications	2	3	5	6
110	Reading	9	10	9	9
111	Business English	0	1	3	3
112	Other English Courses	2	3	6	6

NOTE: Frequencies reported are based on the responses of 13 schools.

SOCIAL STUDIES	GRADE	9	10	11	12
201	U.S./American History	1	2	13	6
202	European History	2	2	1	1
203	Survey of Western World History	2	1	1	1
204	Survey of Ancient World History	3	1	2	1
205	History, Special Topics	0	0	1	1
206	Social Sciences	2	4	4	6
207	Area Studies	0	2	3	3
208	Government and Law	5	2	1	3
209	Other Social Studies Courses	3	2	2	4

BUSINESS	GRADE	9	10	11	12
301	Introductory Business Skills	5	6	4	2
302	Advanced Clerical Skills	0	2	6	6
303	American Business Enterprises	2	1	3	3
304	Introductory Accounting	2	4	4	2
305	Advanced Accounting	0	1	3	6
306	Business Management	1	2	4	4
307	Business Law	1	1	3	5
308	Entrepreneurship	1	1	3	3
309	Financial Management	1	2	3	2
310	Strategic Management	0	0	—	—
311	Computer Applications in Mgmt.	0	1	3	2
312	Technical Drawing I	5	6	4	3
313	Technical Drawing II	3	4	6	5

COMPUTER SCIENCE	GRADE	9	10	11	12
301	Intro. to Computer Concepts	2	2	4	4
302	Word Processing	1	3	3	3
303	Intro. to Computer Programming	2	4	5	4
304	Computer Math	1	1	2	1
305	BASIC	0	1	2	2
306	FORTRAN	0	1	1	1
307	COBOL I	0	1	2	2
308	COBOL II	0	—	—	—
309	PASCAL	0	1	1	2
310	LOTUS	0	—	—	—
311	Other Computer Courses	1	3	4	4

THEATER & MUSIC GRADE	9	10	11	12
Introduction to Theater	1	1	1	1
Acting I & II	1	1	1	1
Dramatic Arts	1	1	1	1
Music Appreciation	1	3	3	3
Music History	1	0	1	1
Voice Lessons	0	—	—	—
Instrument Lessons	3	3	3	3
Choral or Instrumental Conducting	0	0	2	2
Ballet I & II	0	—	—	—
Dance: Folk, Modern Tap or Jazz	0	0	1	1

ART GRADE	9	10	11	12
Art Materials and Safeguards	—	—	—	—
Drawing I	2	2	2	2
Drawing II	0	1	1	1
Design Fundamentals	0	1	2	1
Art Survey	2	0	1	1
Art History	0	1	1	1
Theory of Color	—	—	—	—
Painting	1	2	2	2
Pottery/Sculpture I	0	2	2	2
Anatomy for Artists/Sculpture	0	—	—	—

LANGUAGE GRADE	9	10	11	12
French I	4	3	3	3
French II	2	4	3	3
French III	1	2	4	3
Spanish I	4	3	4	3
Spanish II	1	4	4	3
Spanish III	1	2	5	2
German I	3	1	1	1
German II	0	3	2	1
German III	0	0	1	0
Latin I	3	1	2	1
Latin II	0	3	1	1
Latin III	0	0	1	0
Other Language Courses	1	1	2	2

PHYSICAL ED. AND HEALTH GRADE	9	10	11	12
Freshman Physical Education	10	—	0	0
Sophomore Physical Education	—	11	0	0
Junior Physical Education	—	0	9	1
Senior Physical Education	—	0	1	9
Marriage and Family	1	1	3	3

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Sex Education	1	1	1	1
Substance Abuse	2	2	2	2
Morality and Ethics	—	—	—	—
Heath and Nutrition	8	3	4	4
Conditioning	—	—	—	—
First Aid/CPR	—	—	—	—
Stress Management	—	—	—	—

Table 8

The Frequency offF Course Selection by Grade Level at Regional Vocational Technical High Schools

MATH	GRADE	9	10	11	12
301	Remedial/Basic Math	26	25	21	17
302	Practical/General Math	24	23	17	17
303	Algebra I, Two Year Sequence	19	17	15	9
304	Algebra I, One Year Sequence	23	18	12	8
305	Geometry	5	22	25	16
306	Algebra II	4	14	24	21
307	Pre-Calculus	1	2	6	12
308	Trigonometry	1	5	8	20
309	Calculus	1	1	1	5
310	Business Math	1	4	13	14
311	Special Topics/Statistics	0	1	2	4
312	Other Math Courses	4	9	10	13

SCIENCE	GRADE	9	10	11	12
401	Biology I	4	18	10	9
402	Biology II/Advanced Biology	0	3	6	4
403	Life Science, Special Topics	7	15	8	8
404	Intro to Physical Science	11	6	6	5
405	Advanced Physics	0	1	8	19
406	Physics II	0	2	5	9
407	Chemistry I	0	3	17	13
408	Advanced Chemistry	0	1	6	5
409	Physical Science, Special Topics	4	4	8	7
410	Earth Science	4	4	3	5
411	Earth Enviro. Sci., Spec. Topics	2	2	6	8
412	General Science	9	4	3	2
413	Other Science Courses	2	2	4	4

ENGLISH/COMMUNICATIONS	GRADE	9	10	11	12
101	Freshman English	21	0	0	0
102	Sophomore English	1	21	0	0
103	Junior English	1	0	18	0
104	Senior English	1	0	0	18
105	American Literature	1	4	11	4
106	British Literature	0	0	2	4
107	Composition	7	8	8	10
108	Literature, Special Topics	3	4	8	12
109	Communications	3	4	6	7
110	Reading	17	16	14	14
111	Business English	1	3	3	3
112	Other English Courses	4	5	4	8

NOTE: Frequencies reported are based on the responses of 26 schools.

SOCIAL STUDIES	GRADE	9	10	11	12
201	U.S./American History	6	20	17	3
202	European History	1	0	1	1
203	Survey of Western World History	2	3	3	6
204	Survey of Ancient World History	2	1	1	2
205	History, Special Topics	0	0	7	7
206	Social Sciences	4	1	4	12
207	Area Studies	2	0	1	1
208	Government and Law	10	2	6	9
209	Other Social Studies Courses	4	3	6	6

BUSINESS	GRADE	9	10	11	12
301	Introductory Business Skills	5	6	4	3
302	Advanced Clerical Skills	0	1	2	3
303	American Business Enterprises	2	2	2	2
304	Introductory Accounting	2	6	10	10
305	Advanced Accounting	0	0	5	6
306	Business Management	1	3	6	7
307	Business Law	0	1	2	2
308	Entrepreneurship	0	0	0	3
309	Financial Management	0	0	0	1
310	Strategic Management	—	—	—	—
311	Computer Applications in Mgmt.	0	1	3	2
312	Technical Drawing I	12	10	6	5
313	Technical Drawing II	3	7	10	10

COMPUTER SCIENCE	GRADE	9	10	11	12
301	Intro. to Computer Concepts	6	6	5	6
302	Word Processing	3	5	9	9
303	Intro. to Computer Programming	2	2	2	2

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304	Computer Math	2	2	4	3
305	BASIC	3	3	3	2
306	FORTRAN	—	—	—	—
307	COBOL I	2	2	3	3
308	COBOL II	2	2	3	3
309	PASCAL	1	1	1	1
310	LOTUS	2	2	2	4
311	Other Computer Courses	6	6	6	7
THEATER & MUSIC	**GRADE**	**9**	**10**	**11**	**12**
	Introduction to Theater	0	0	0	1
	Acting I & II	—	—	—	—
	Dramatic Arts	0	0	0	1
	Music Appreciation	1	1	1	1
	Music History	0	0	1	0
	Voice Lessons	—	—	—	—
	Instrument Lessons	1	1	1	1
	Choral or Instrumental Conducting	—	—	—	—
	Ballet I & II	—	—	—	—
	Dance: Folk, Modern Tap or Jazz	—	—	—	—
ART	**GRADE**	**9**	**10**	**11**	**12**
	Art Materials and Safeguards	1	1	1	1
	Drawing I	2	2	1	1
	Drawing II	0	2	2	2
	Design Fundamentals	2	3	3	3
	Art Survey	2	1	1	1
	Art History	1	1	1	1
	Theory of Color	2	2	2	2
	Painting	1	2	2	2
	Pottery/Sculpture I	1	2	2	2
	Anatomy for Artists/Sculpture	2	2	2	2
LANGUAGE	**GRADE**	**9**	**10**	**11**	**12**
	French I	—	—	—	—
	French II	—	—	—	—
	French III	—	—	—	—
	Spanish I	1	2	3	3
	Spanish II	1	1	2	2
	Spanish III	—	—	—	—
	German I	—	—	—	—
	German II	—	—	—	—
	German III	—	—	—	—
	Latin I	—	—	—	—
	Latin II	—	—	—	—
	Latin III	—	—	—	—
	Other Language Courses	—	—	—	—

PHYSICAL ED. AND HEALTH	GRADE	9	10	11	12
	Freshman Physical Education	23	1	1	0
	Sophomore Physical Education	1	23	0	1
	Junior Physical Education	1	0	22	0
	Senior Physical Education	0	1	0	22
	Marriage and Family	1	2	3	5
	Sex Education	5	6	3	4
	Substance Abuse	5	5	5	6
	Morality and Ethics	2	2	2	5
	Health and Nutrition	9	10	4	2
	Conditioning	4	4	3	3
	First Aid/CPR	3	5	3	2
	Stress Management	0	0	0	2

Table 9

The Frequency of Course Selection by Grade Level at City and Town Vocational Technical High Schools

MATH	GRADE	9	10	11	12
301	Remedial/Basic Math	6	6	4	4
302	Practical/General Math	5	3	3	3
303	Algebra I, Two Year Sequence	1	2	1	1
304	Algebra I, One Year Sequence	5	3	3	2
305	Geometry	1	3	4	2
306	Algebra II	1	3	4	4
307	Pre-Calculus	0	0	0	1
308	Trigonometry	0	0	1	4
309	Calculus	0	0	1	1
310	Business Math	0	3	2	2
311	Special Topics/Statistics	0	1	1	1
312	Other Math Courses	0	1	1	3

SCIENCE	GRADE	9	10	11	12
401	Biology I	1	2	2	1
402	Biology II/Advanced Biology	0	0	0	1
403	Life Science, Special Topics	—	—	—	—
404	Intro to Physical Science	2	0	3	3
405	Advanced Physics	0	1	1	2
406	Physics II	0	0	1	1
407	Chemistry I	0	1	1	0
408	Advanced Chemistry	—	—	—	—
409	Physical Science, Special Topics	0	0	1	1
410	Earth Science	2	1	1	1

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411	Earth Enviro. Sci., Spec. Topics	—	—	—	—
412	General Science	1	1	0	0
413	Other Science Courses	0	0	2	3

ENGLISH/COMMUNICATIONS	GRADE	9	10	11	12
101	Freshman English	9	1	1	1
102	Sophomore English	1	9	—	1
103	Junior English	1	1	7	1
104	Senior English	1	1	1	7
105	American Literature	0	0	1	0
106	British Literature	0	0	0	1
107	Composition	1	1	1	1

ENGLISH/COMMUNICATIONS	GRADE	9	10	11	12
108	Literature, Special Topics	1	1	1	2
109	Communications	0	1	1	2
110	Reading	3	3	3	3
111	Business English	0	0	1	2
112	Other English Courses	0	0	0	2

NOTE: Frequencies reported are based on the responses of 11 schools.

SOCIAL STUDIES	GRADE	9	10	11	12
201	U.S./American History	0	4	6	1
202	European History	—	—	—	—
203	Survey of Western World History	2	0	0	0
204	Survey of Ancient World History	—	—	—	—
205	History, Special Topics	0	1	1	1
206	Social Sciences	0	0	0	2
207	Area Studies	0	0	0	1
208	Government and Law	4	2	1	1
209	Other Social Studies Courses	3	1	0	2

BUSINESS	GRADE	9	10	11	12
301	Introductory Business Skills	0	1	0	0
302	Advanced Clerical Skills	—	—	—	—
303	American Business Enterprises	0	0	1	0
304	Introductory Accounting	0	0	1	0
305	Advanced Accounting	0	0	0	1
306	Business Management	0	1	0	0
307	Business Law	0	0	1	0
308	Entrepreneurship	—	—	—	—
309	Financial Management	—	—	—	—
310	Strategic Management	—	—	—	—
311	Computer Applications in Mgmt.	—	—	—	—
312	Technical Drawing I	1	2	2	2
313	Technical Drawing II	1	2	2	2

COMPUTER SCIENCE	GRADE	9	10	11	12
301	Intro. to Computer Concepts	1	2	3	2
302	Word Processing	0	2	2	2
303	Intro. to Computer Programming	0	3	3	1
304	Computer Math	0	2	2	1
305	BASIC	0	1	0	0
306	FORTRAN	0	2	2	2
307	COBOL I	0	1	0	0
308	COBOL II	0	0	1	1
309	PASCAL	0	0	0	1
310	LOTUS	0	1	0	0
311	Other Computer Courses	0	1	1	1

THEATER & MUSIC	GRADE	9	10	11	12
	Introduction to Theater	—	—	—	—
	Acting I & II	—	—	—	—
	Dramatic Arts	0	1	1	1
	Music Appreciation	—	—	—	—
	Music History	—	—	—	—
	Voice Lessons	—	—	—	—
	Instrument Lessons	0	1	1	1
	Choral or Instrumental Conducting	—	—	—	—
	Ballet I & II*	—	—	—	—
	Dance: Folk, Modern Tap or Jazz	—	—	—	—

ART	GRADE	9	10	11	12
	Art Materials and Safeguards	—	—	—	—
	Drawing I	2	2	2	2
	Drawing II	—	—	—	—
	Design Fundamentals	—	—	—	—
	Art Survey	1	1	1	1
	Art History	—	—	—	—
	Theory of Color	—	—	—	—
	Painting	—	—	—	—
	Pottery/Sculpture I	1	1	0	0
	Anatomy for Artists/Sculpture	—	—	—	—

LANGUAGE	GRADE	9	10	11	12
	French I	1	1	1	1
	French II	0	1	1	1
	French III	0	0	1	1
	Spanish I	1	1	1	1
	Spanish II	0	1	1	1
	Spanish III	0	0	1	1
	German I	1	1	1	1

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German II	0	1	1	1
German III	0	0	1	1
Latin I	1	1	1	1
Latin II	0	1	1	1
Latin III	0	0	1	1
Other Language Courses	0	0	1	1

PHYSICAL ED. AND HEALTH GRADE	9	10	11	12
Freshman Physical Education	6	0	0	0
Sophomore Physical Education	0	6	0	0
Junior Physical Education	0	0	5	0
Senior Physical Education	0	0	0	5
Marriage and Family	—	—	—	—
Sex Education	0	0	1	0
Substance Abuse	—	—	—	—
Morality and Ethics	—	—	—	—
Health and Nutrition	0	1	1	1
Conditioning	—	—	—	—
First Aid/CPR	—	—	—	—
Stress Management	—	—	—	—

Table 10

The Frequency of Course Selection by Grade Level at County and Independent Schools

MATH	GRADE	9	10	11	12
301	Remedial/Basic Math	3	2	1	1
302	Practical/General Math	2	3	1	1
303	Algebra I, Two Year Sequence	3	2	2	1
304	Algebra I, One Year Sequence	2	1	2	1
305	Geometry	0	1	1	1
306	Algebra II	0	0	1	1
307	Pre-Calculus	—	—	—	—
308	Trigonometry	0	0	0	1
309	Calculus	—	—	—	—
310	Business Math	0	0	1	2
311	Special Topics/Statistics	0	0	1	0
312	Other Math Courses	1	1	1	1

SCIENCE	GRADE	9	10	11	12
401	Biology I	0	0	1	0
402	Biology II/Advanced Biology	—	—	—	—
403	Life Science, Special Topics	—	—	—	—
404	Intro to Physical Science	0	0	1	0

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405	Advanced Physics	—	—	—	—
406	Physics II	—	—	—	—
407	Chemistry I	0	0	1	0
408	Advanced Chemistry	—	—	—	—
409	Physical Science, Special Topics	—	—	—	—
410	Earth Science	1	1	0	0
411	Earth Enviro. Sci., Spec. Topics	—	—	—	—
412	General Science	1	1	0	0
413	Other Science Courses	0	0	0	1

ENGLISH/COMMUNICATIONS	GRADE	9	10	11	12
101	Freshman English	3	0	0	0
102	Sophomore English	0	2	0	0
103	Junior English	0	0	2	0
104	Senior English	0	0	0	2
105	American Literature	1	1	2	1
106	British Literature	0	0	0	1
107	Composition	1	3	2	2
108	Literature, Special Topics	1	1	0	1
109	Communications	1	1	1	1
110	Reading	2	3	1	1
111	Business English	0	1	1	2
112	Other English Courses	0	0	1	1

NOTE: Frequencies reported are based on the responses of 3 schools.

SOCIAL STUDIES	GRADE	9	10	11	12
201	U.S./American History	0	0	3	2
202	European History	—	—	—	—
203	Survey of Western World History	—	—	—	—
204	Survey of Ancient World History	—	—	—	—
205	History, Special Topics	—	—	—	—
206	Social Sciences	—	—	—	—
207	Area Studies	—	—	—	—
208	Government and Law	—	—	—	—
209	Other Social Studies Courses	0	0	0	1

BUSINESS	GRADE	9	10	11	12
301	Introductory Business Skills	1	1	0	1
302	Advanced Clerical Skills	—	—	—	—
303	American Business Enterprises	—	—	—	—
304	Introductory Accounting	—	—	—	—
305	Advanced Accounting	—	—	—	—
306	Business Management	—	—	—	—
307	Business Law	—	—	—	—

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308	Entrepreneurship	—	—	—	—
309	Financial Management	—	—	—	—
310	Strategic Management	—	—	—	—
311	Computer Applications in Mgmt.	—	—	—	—
312	Technical Drawing I	—	—	—	—
313	Technical Drawing II	—	—	—	—

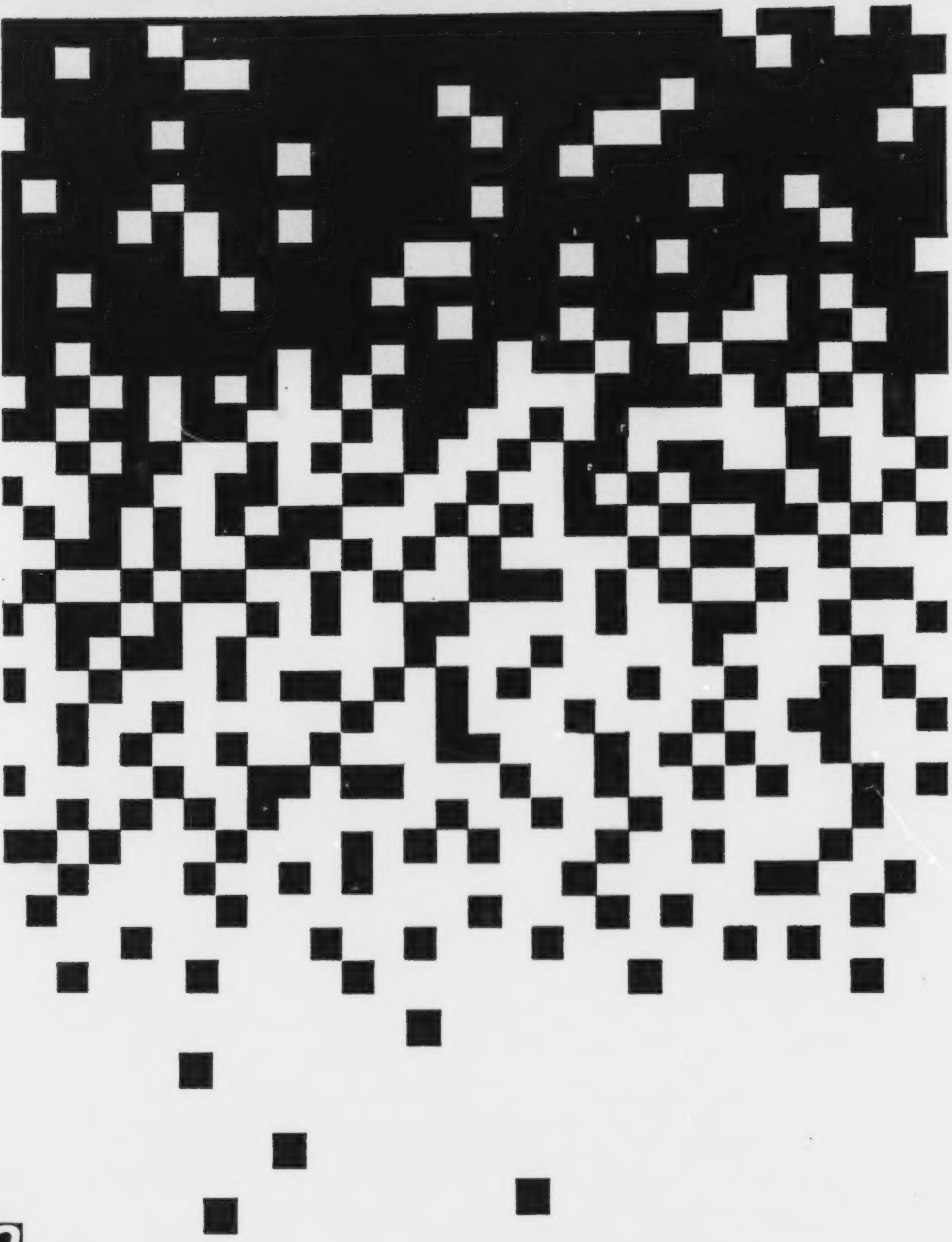
COMPUTER SCIENCE	GRADE	9	10	11	12
301	Intro. to Computer Concepts	1	2	1	1
302	Word Processing	1	1	1	1
303	Intro. to Computer Programming	—	—	—	—
304	Computer Math	—	—	—	—
305	BASIC	—	—	—	—
306	FORTRAN	—	—	—	—
307	COBOL I	—	—	—	—
308	COBOL II	—	—	—	—
309	PASCAL	—	—	—	—
310	LOTUS	—	—	—	—
311	Other Computer Courses	—	—	—	—

THEATER & MUSIC	GRADE	9	10	11	12
	Introduction to Theater	—	—	—	—
	Acting I & II	—	—	—	—
	Dramatic Arts	—	—	—	—
	Music Appreciation	—	—	—	—
	Music History	—	—	—	—
	Voice Lessons	—	—	—	—
	Instrument Lessons	—	—	—	—
	Choral or Instrumental Conducting	—	—	—	—
	Ballet I & II	—	—	—	—
	Dance: Folk, Modern Tap or Jazz	—	—	—	—

ART	GRADE	9	10	11	12
	Art Materials and Safeguards	—	—	—	—
	Drawing I	—	—	—	—
	Drawing II	—	—	—	—
	Design Fundamentals	—	—	—	—
	Art Survey	—	—	—	—
	Art History	—	—	—	—
	Theory of Color	—	—	—	—
	Painting	—	—	—	—
	Pottery/Sculpture I	—	—	—	—
	Anatomy for Artists/Sculpture	—	—	—	—

LANGUAGE	GRADE	9	10	11	12
French I		—	—	—	—
French II		—	—	—	—
French III		—	—	—	—
Spanish I		—	—	—	—
Spanish II		—	—	—	—
Spanish III		—	—	—	—
German I		—	—	—	—
German II		—	—	—	—
German III		—	—	—	—
Latin I		—	—	—	—
Latin II		—	—	—	—
Latin III		—	—	—	—
Other Language Courses		—	—	—	—

PHYSICAL ED. AND HEALTH	GRADE	9	10	11	12
Freshman Physical Education		3	0	0	0
Sophomore Physical Education		0	3	0	0
Junior Physical Education		0	0	3	0
Senior Physical Education		0	0	0	3
Marriage and Family		—	—	—	—
Sex Education		2	2	0	0
Substance Abuse		2	2	0	0
Morality and Ethics		1	1	0	0
Health and Nutrition		1	2	0	0
Conditioning		—	—	—	—
First Aid/CPR		—	—	—	—
Stress Management		1	1	0	0



Summarized Considerations and Additional Recommendations

IX. SUMMARIZED CONSIDERATIONS AND ADDITIONAL RECOMMENDATIONS

Project participants viewed curriculum as a dynamic process which promotes active, thought provoking, facilitating and individual assessment activities which develop each student's potential as a learner. The statewide and local gatherings of the project established forums for communication and cross sharing of promising practices found within the settings of the Commonwealth's fifty-nine vocational technical high schools offering five or more Chapter 74 programs.

Project investigators found an informative array of vibrant and exciting integrated learning activities employed by the academic teachers within the Massachusetts vocational technical system. With a true sense of pride,practitioners described field-based experiences and lessons which included:

- A special education Vocational Industrial Clubs of America (VICA) student who combined the training resources of her vocational technical laboratory and related instructors to research organize a project with the technical assistance of English/Communications and Social Studies teachers who critiqued, reviewed grammar and confirmed historical accuracy along with the school's librarian who video taped practice presentations to refine further the student's efforts. The resultant product earned special recognition during statewide extemporaneous speaking competitions.
- A student who worked with related and academic instructors in the design and delivery of written and oral justification to the voters of her community for a special town meeting which contributed significantly to a favorable vote to expand the facility and membership of that member town's regional vocational technical high school district.
- A science laboratory which utilizes robots constructed in electronics to demonstrate various scientific experiments and thus provide the science instructor the opportunity to observe and extend additional individualized instruction.
- A mathematical lesson with linkage to a Small Business Development Center, retired business representatives, alumni and banking personnel which focused on construction and other job-estimating skills to reduce unnecessarily costly or other poor business practices in vocational technical ventures.
- A myriad of challenging simulation and gaming devices which ranged from concentration camp survival exercises in social studies classrooms to solid waste disposal ecological decisions in science courses. Other academic settings addressing topics and issues of nuclear technology, a host of abuse concerns and gender, race and other equity considerations.
- An English/Communications lesson which incorporated literary readings by a poet who is also a licensed, practicing, non-traditional electrician.
- An art class which developed and exhibited student drawings focused upon environmental, social political personal fears, and morality questions in cooperation with practicing artists, museum staff and social and conservation organizations.
- An instructor who was exploring the benefits of student developed and refined three minute video taped interviews, rather than dependence upon the traditional written resume, to expand student job opportunity options.

The Model Academic Project viewed competency-based vocational education (CBVE) as one of the most significant curricular resources available within the Commonwealth. CBVE was considered a remarkable combination of firmly established educational approaches coupled with a logical and systematic process of putting it all together.

Project participants praised the initiative undertaken by the Division of Occupational Education in the identification, development and industry validation of vocational technical competencies and the accessibility of this school-based curriculum development project. While the CBVE project proved to be a paramount first step in tailoring Massachusetts' vocational technical programs to respond to the knowledge skills and attitudes critical to student's educational and professional future, the definition of mathematics and science competencies made possible via the Math Science Competencies Project (MSCP) assisted high school instructors immeasurably. At the time of this report some twenty-six CBVE programs were designed and available and some twenty-four of those (note asterisks) have accompanying MSCP manuals. Learning guides currently exist for the following:

ACCOUNTING and COMPUTING *
AUTO BODY REPAIR *
AUTO TECHNOLOGY *
CARPENTRY *
CHILD DEVELOPMENT ASSISTANT *
COMMERCIAL ART *
COMPUTER TECHNOLOGY *
DRAFTING *
ELECTRICAL TECHNOLOGY *
ELECTRONICS TECHNOLOGY *
ELECTROMECHANICAL TECHNOLOGY
FASHION DESIGN/MARKETING *
FINANCE and CREDIT *
FOODS MANAGEMENT,
PRODUCTION and SERVICES *
GENERAL MERCHANDISING *
GRAPHIC ARTS *
HEALTH ASSISTANT *
ORNAMENTAL
  HORTICULTURAL/TURF MGNT. *
HOTEL and LODGING *
HVAC and REFRIGERATION *
MACHINE TECHNOLOGY *
MEDICAL ASSISTANT *
METAL FABRICATION *
PAINTING and DECORATING *
PLUMBING and PIPE FITTING *

The essential elements of the Massachusetts competency-based instructional program include the following:

#1. Competencies are rigorously identified and verified

#2 Assessment criteria and conditions are explicitly stated in advance.

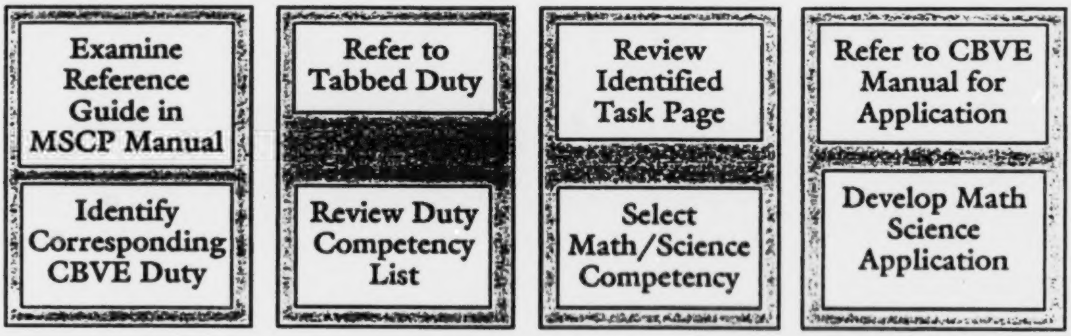
#3 Instruction provides for the individual development and evaluation of each competency.

#4 Students progress at their own best rate.

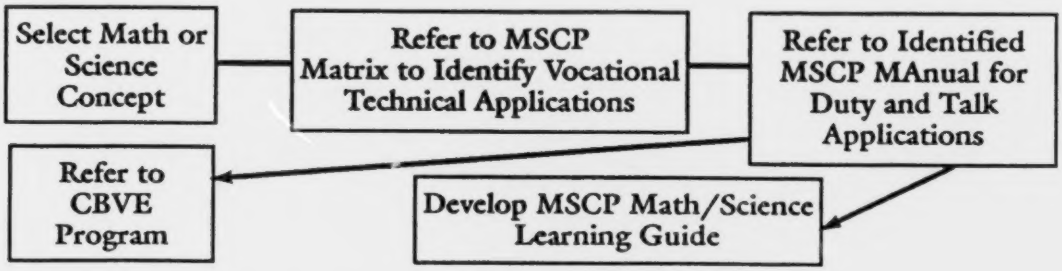
#5 Final assessment of competency achievement requires actual task performance.

The main focus of the Math Science Competencies Project has been the identification of mathematics and science competencies necessary to complement the designated competency based vocational technical program areas. Since its inception during 1984, the MSCP has identified academic competencies by compiling them into manuals which consist of matrices designed via input by statewide vocational technical educators and their academic counter-parts. All competencies found in the matrix format are sequenced progressively within the areas of mathematics, biological science and physical science. The matrix can be useful in designing and updating mathematics and science curricula to match the career path program selected by individual students. Furthermore, by examining the sequence and distribution of the competencies, mathematics and sciences may be designed for clusters of students who are in different vocational technical areas by having similar academic requirements. It should be noted that the matrices reflect the inclusion of competencies paired against a specific task within the CBVE curriculum. Competencies not listed in the MSCLP matrix do not necessarily indicate suggested omission from a particular mathematics or science course and instructor may choose to include additional competencies. Throughout their deliberations, the Division of Occupational Education and the staff of the MSCP project have encouraged a full program of mathematics and science for all students.

The steps for using the MSCP manual can be graphically depicted in the following manner:


Examine Reference Guide in MSCP Manual
Identify Corresponding CBVE Duty
Refer to Tabbed Duty
Review Duty Competency List
Review Identified Task Page
Select Math/Science Competency
Refer to CBVE Manual for Application
Develop Math Science Application

Since 1987, The MSCP staff has been involved in the development of an additional series of learning guides in mathematics and physical science. Using the MSCP matrix approach related mathematics and/or science competencies were grouped to form duties. Within these duties, one or more of the identified competencies comprise stated tasks and for each task a learning guide is offered. The steps involved in the development of these learning guides are outlined as follows:


Select Math or Science Concept
Refer to MSCP Matrix to Identify Vocational Technical Applications
Refer to Identified MSCP MAnual for Duty and Talk Applications
Refer to CBVE Program
Develop MSCP Math/Science Learning Guide

Each learning guide contains two objectives. The first objective is a review of the competencies or concepts to be addressed in the task. The review is teacher-directed; that is, the teacher will use instructional materials of their choice. Following the review, each student will complete a "self-check" to determine mastery of the presented concepts of "self-check answer key" is included in the guide and it may be used to correct the student's responses. At the discretion of the instructor the student may move to continue to review the concept or proceed to the next objective.

The second objective provides reinforcement of the concepts to vocational technical programs and the relevancy of those concepts to vocational technical programs and the relevancy of those concepts to everyday life. This objective centers around the completion of applicable practical situations and problems. The guides may be utilized to complement and reinforce existing mathematics and science courses but not to replace them. These teacher generated resources can provide support to the instructor by expanding opportunities for creativity in the classroom and by providing instructional material for homework. In summary, the goal of this component of the MSCP project is the development of learning guides which reinforce, relate and enhance the vocational technical training of each student by connecting their academic and vocational technical studies.

Additional Recommendations:

This section should not be viewed in isolation of the other Chapters of this report. Although this segment attempts to highlight many of the project's recommendations numerous other suggestions are sprinkled throughout the overall document. Specific strategies encouraged by Model Academic Project contributors include the following:

Establish procedures which enable schools to receive, store, integrate and distribute additional curriculum materials and information services via networked satellite, computer, video, laser, electronic mail or other technology. Utilized such technology so that school staff may electronically select, access and integrate materials and services from national regional organizations, educational publisher, software vendors and nonprofit and public agencies.

Promote quality academic learning which protects and insures that the avenues for accessing post secondary and higher education training are always open to the graduates of secondary vocational technical high schools within the Commonwealth.

Discourage any retainment of students within the same grade level solely on the basis of poor performance and/or the promotion of students as a result of standardized test scores.

Cluster a portion, or core, of student's academic course and non course schedule with consideration for the selected vocational or technical career path.

Consider incorporating a senior project concept within local diploma requirements and utilize the negotiated project to enhance community service, promote positive image, expand recruitment outreach and placement potential and provide a significant culminating and/or complementing activity in which the student can illustrate mastery as well as oral and written communication skills.

Analyze academic learning activities to expand opportunities to vary teaching methodologies, introduce gaming strategies, blend critical thinking skill tasks and provide for learning which responds to both left and right brain dominant learning.

Establish course and non course integrated micro computer literacy activities which enable students to gain a substantial level of computer awareness and to develop at least a functional level of skills in utilizing computers as a tool to aid in problem solving and the completion of homework and/or other assignments.

Utilize staff in service training time to share more information among academic, related, vocational technical and support staff members to promote an on going exchange of the technology and integrated academic learning potentials. Arrange for vocational technical instructors to offer mini workshops covering occupational skills to assist academic teachers in further relating their instruction to work environment realities. Academic instructors should also be provided opportunities to work with vocational technical colleagues in developing basic skills and other academic learning within all learning environments.

Consider using commercially-developed curriculum such as the Principles of Technology, Applied Math, Applied Communication, Quality Assurance and others developed by consortia of state agencies organized by the Center for Occupational Research and Development (Waco, Texas) and the Agency for Instructional Technology (Bloomington, Indiana).

Recognize that students are capable workers and that they have within them the potential to accomplish their dreams and expectations, Select academic learning activities which assist students in identifying their gifts and strengths and empower them to develop positive and productive thinking and work habits.

Devise a formal cohesive plan for integrating academic and vocational technical education and basic skills learning within the total school setting.

Link the academic learning activities within schools with national and cooperate laboratories, museums, libraries, universities, colleges, industries and others.

Involve students in appropriate contests and challenges to instill a healthy sense of competition, team working skills, self-worth, problem solving, decision making, analytical reasoning, communication and appreciation of uniqueness of each individual's potential. In addition, to coordinated competitive activities on the local level school staff are encouraged to investigate the learning opportunities made available via statewide student organizations such as the Future Farmers of America (FFA), Vocational Industrial Clubs of America (VICA), Distributive Educations Clubs of America (DECA), and others.

Establish local professional improvement recommendations and review committees with academic, vocational technical, support staff and advisory committee representation to guide and offer suggestions and otherwise provide instructional personnel with assistance in identifying and accessing professional improvement activities which truly strengthen abilities to teach.

Create classroom strategies which reward slower learners for their demonstrated progress and challenge able students according to their abilities. In general, teachers should set high expectations, insist that students put forth the effort required to meet the school's academic standards and nudge students to the realism of judging themselves via performance.

Cooperate with the bilingual, special education and other support staff in adapting instruction to the individual needs of student learners to provide them with an opportunity to develop positive self-image, a sense of independence and greater ability to think independently.

Regularly identify and validate academic competencies as a component of defining the basic occupational and personal skills and educational strategies which will help students to prepare for the next career step they will take, whether it is further education, employment, or some other option. Also develop learning which considers the realities and coping strategies for dealing with failure, stress management, death, suicide, chemical and alcohol abuse, violence prevention, child abuse and other concerns.

With the warming relationships with the Soviet bloc and the removal of most trade barriers across the foreign economic community, encourage learning activities and student research projects which include the geographical, economical, cultural, social and other considerations of a global economy.

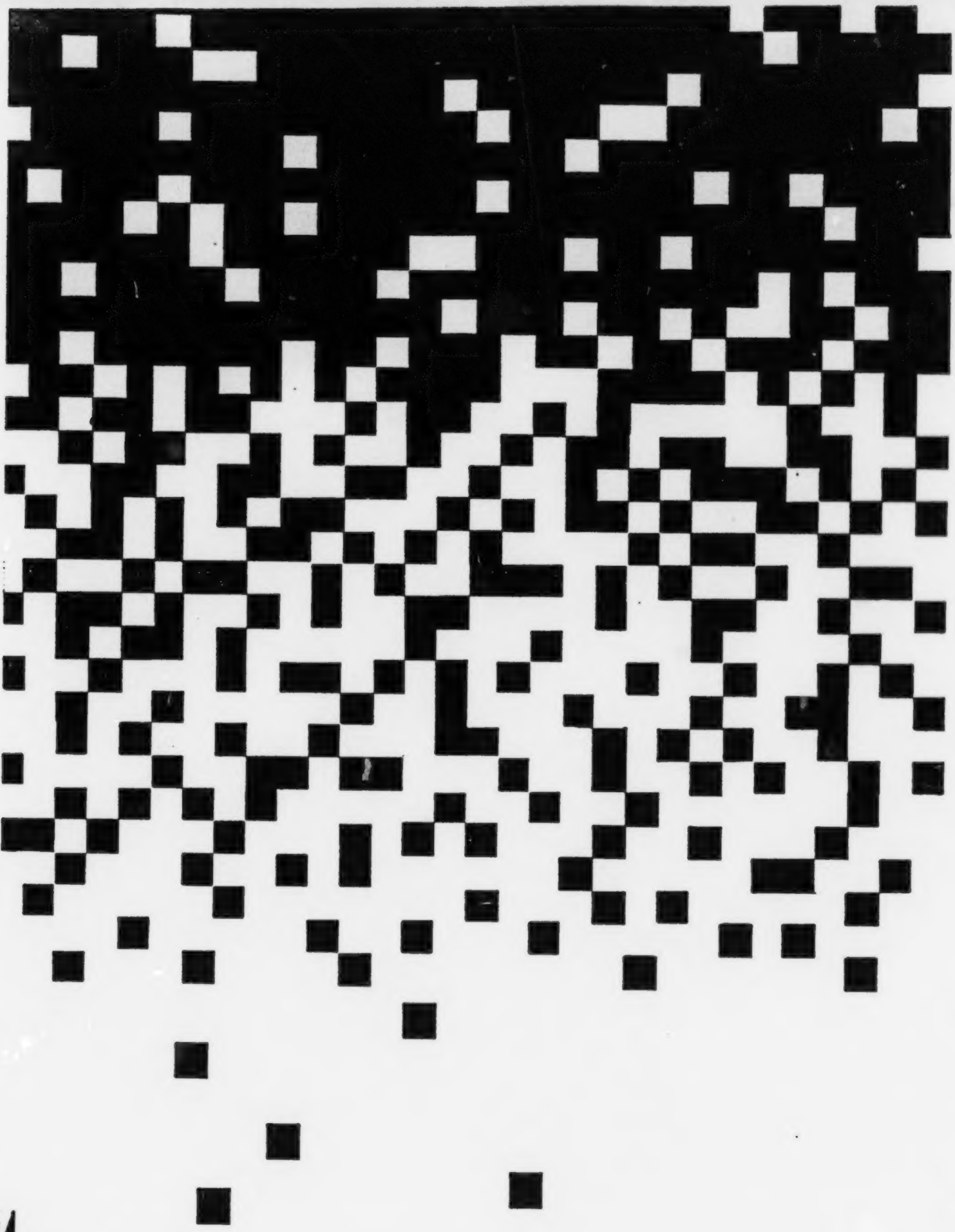
Provide opportunities to reinvigorate the attitudinal climate of the school and individual classrooms by establishing shared decision-making advisory groups which meet periodically to discuss grades, schedules, problems areas and other topics.

Identify an appropriate contact person in each of the vocational technical schools who will receive in service training in the statewide curriculum models and products and then serve as the local liaison for the dissemination, orientation assistance and school based technical help to others from that local educational agency.

Access the data available via the regional vocational technical high school based assessment centers in the design and development of an individualized instructional plan for each student.

Include a technological and curriculum update strategy within the annual local operational plan.

Devise horizontal and vertical articulation opportunities which foster integrated academic and vocational technical learning and a smooth transition to post secondary or higher education training.



Appendices

APPENDIX A

PROJECT ADVISORY COMMITTEE

Teresa Bellini
Northern BerkshireRegional Vocational Technical High School

Tomasa Couverthier
Boston Public Schools

Cynthia Fiducia
Greater Lawrence Technical School

Harvey Evans
Massachusetts Rehabilitation Commission

Jeff Johnson
Quincy Vocational Technical High School

Ray Larivee
Cape Cod Regional Vocational Technical High School

Leslie Lesperance
South Middlesex Regional Vocational Technical High School

Frank Longo
Blue Hills Regional Vocational Technical High School

Charles Lyons
Shawsheen Valley Regional Vocational Technical High School

Richard Marchand
Greater Lowell Regional Vocational Technical High School

Marsha McDonough
Waltham Vocational Technical High School

John Nevins
Westfield State College

Patricia Siddall
Bay Path Regional Vocational Technical High School

Mary Urban
Fanning Trade High School

APPENDIX B

PARTICIPANT LIST

English Participants

English	School	Street	City	State	Zip
Pat Siddall	Bay Path Regional Voc Tech	Muggett Hill Road	Charlton	MA	01507
Steven Kedski	Blackstone Valley Reg. Voc Tech	Pleasant Street	Upton	MA	01568
Tom Mellett	Blue Hills Regional Technical HS	800 Randolph Street	Canton	MA	02021
Herb Hamilton	Bristol-Plymouth Reg. Technical HS	940 County Street	Taunton	MA	02780
Richard P. Curcio	Cape Cod Regional Technical HS	Pleasant Lake Avenue	Harwich	MA	02645
Margaret E. Hopkins	Diman Regional Voc Tech HS	Stonehaven Road	Fall River	MA	02723
Judy Naso	Everett Voc Tech HS	121 Pine Street	Everett	MA	02149
Marguerite Monet	Franklin County Tech. School	Industrial Boulevard	Turners Falls	MA	01376
Cynthia Fiducia	Greater Lawrence Technical School	57 River Road	Andover	MA	01810
Kerry Cavallaro	Greater Lowell Regional Voc Tech HS	Pawtucket Boulevard	Tyngsboro	MA	01879
John M. Sullivan	Greater New Bedford Reg.l Voc Tech	11121 Ashley Blvd.	New Bedford	MA	02745
Richard N. Mailloux	Leominster High School	122 Granite Street	Leominster	MA	01453
Richard Aucone	Lynn Voc Tech Institute	80 Neptune Boulevard	Lynn	MA	01902
Mary Reynolds	Medford Voc Tech High School	489 Winthrop Street	Medford	MA	02155
Rita A. Gordon	Minuteman Regional Voc Tech HS	758 Marrett Road	Lexington	MA	02173
William E. Lekas	Nashoba Valley Technical HS	100 Littleton Road	Westford	MA	01886
Noreen Mullen	North Shore Regional Voc Tech HS	20 Batch Street	Beverly	MA	01915
Neil Valeriani	Northeast Metropolitan Reg. Voc Tech	Hemlock Road	Wakefield	MA	01880
Gary Brown	Old Colony Regional Voc Tech HS	476 North Avenue	Rochester	MA	02770
Marguerite A. Murphy	Putnam Voc Tech HS	1300 State Street	Springfield	MA	01109
John P. Sullivan	Quincy Voc Tech HS	107 Woodward Avenue	Quincy	MA	02169
Ralph Carvalho	Shawsheen Valley Tech. HS	100 Cook Street	Billerica	MA	01866
Dennis Fitzpatrick	Somerville Voc Tech HS	81 Highland Avenue	Somerville	MA	02143
Anna M. Thorpe	South Middlesex Voc Tech HS	750 Winter Street	Framingham	MA	01701
Richard Vernon	Tri-County Regional Voc Tech HS	147 Pond Street	Franklin	MA	02036
William Lord	Upper Cape Cod Reg. Voc Tech HS	220 Sandwich Road	Bourne	MA	02532
Tony Damian	Waltham Voc Tech High School	100 Summer Street	Waltham	MA	02154
Tom Schwaber	Westfield Voc Tech HS	33 Smith Avenue	Westfield	MA	01086
Myles Walsh	Weymouth Voc Tech HS	1051 Commercial Street	S.Weymouth	MA	02189
Paul Hammond	Worcester Voc Tech HS	2 Grove Street	Worcester	MA	01605

Math Participants

Math	School	Street	City	State	Zip
Richard Brennan	Blackstone Valley Regional Voc Tech	Pleasant Street	Upton	MA	01568
Paul Donovan	Blue Hills Regional Technical HS	8000 Randolph Street	Canton	MA	02021
Bruce Crest	Bristol-Plymouth Regional Technical HS	940 County Street	Tauton	MA	01780
Michael Illsley	Cape Cod Regional Technical HS	Pleasant Lake Avenue	Harwich	MA	02645
Edward Gillespie	Diman Regional Voc Tech HS	Stonehaven Road	Fall River	MA	02723
Louise Hammann	Franklin county Technical School	Industrial Boulevard	Turners Falls	MA	01376
Frank Holland	Greater Lawrence Technical School	47 River Road	Andover	MA	01810
Ann Marie Buczek	Greater Lowell Regional Voc Tech HS	Pawtucket Boulevard	Tyngsboro	MA	01879
June C. Stringer	Greater New Bedford Reg. Voc Tech	1121 Ashley Boulevard	New Bedford	MA	02745
Carol Hynes	Leominster High School	122 Granite Street	Leominster	MA	01453
Bart Conlon	Lynn Voc Tech Institute	80 Neptune Boulevard	Lynn	MA	01902
Joseph O'Brien	Medford Voc Tech High School	489 Winthrop Street	Medford	MA	02155
Nello Allegrezza	Milford High School	31 West Fountain Street.	Milford	MA	012757
Rita A. Gordon	Minuteman Regional Voc Tech HS	758 Marrett Road	Lexington	MA	02173
Victor Kiloski	Nashoba Valley Technical HS	100 Littleton Road	Westford	MA	01886
Edward Fallon	North Shore Regional Voc Tech HS	20 Balch Street	Beverly	MA	01915
David Lapierre	Pathfinder Regional Voc Tech HS	Route 181	Palmer	MA	01069
Evelyn Pesce	Putnam Voc Tech HS	1300 State Street	Springfield	MA	01109
Art Thompson	Shawsheen Valley Technical HS	100 Cook Street	Billerica	MA	01866
Jack Hogan	Smith Vocational High School	80 Locust Street	Northampton	MA	01060
Joseph Caruso	Somerville Voc Tech HS	81 Highland Avenue	Somerville	MA	02143
Jean Ford	Southeastern Regional HS	250 Foundry Street	South Easton	MA	02375
Norman Tate	Upper Cape Cod Reg. Voc Tech HS	220 Sandwich Road	Bourne	MA	02532
Gene Stenstrom	Weymouth Voc Tech HS	1051 Commercial Street.	Weymouth	MA	02189
Linda Kaufman	Worcester D. Fanning Trade School	24 Chatham Street	Worcester	MA	01608

Science Participants

Science	School	Street	City	State	Zip
Pat Grasso	Blue Hills Regional Technical HS	800 Randolph Street	Canton	MA	02021
Mike Kacergis	Cape Cod Regional Technical HS	Pleasant Lake Avenue	Harwich	MA	02645
Rogerio Ramos	Diman Regional Voc Tech HS	Stonehaven Road	Fall River	MA	02723
Helen Boland	Franklin County Technical School	Industrial Boulevard	Turners Falls	MA	01376
Dennis Murphy	Greater Lowell Regional Voc Tech HS	Pawtucket Boulevard	Tyngsboro	MA	01879
Kevin Hickey	Medford Voc Tech HS	489 Winthrop Street	Medford	MA	02155
James Amara	Minuteman Regional Voc Tech HS	758 Marrett Road	Lexington	MA	02173
Daniel J. Stark	Nashoba Valley Technical HS	100 Littleton Road	Westford	MA	01886
Phil Duffy	Northeast Metropolitan Reg'l Voc Tech	Hemlock Road	Wakefield	MA	01880
John P. Sullivan	Quincy Voc-Tech HS	107 Woodward Avenue	Quincy	MA	02169
Serhfioy Dacumha	Rindge Technical School	459 Groadway Street	Cambridge	MA	02138
Bill Gordon	Shawsheen Valley Technical HS	100 Cook Street	Billerica	MA	01866
Joseph Pignatiello	Somerville Voc Tech HS	81 Highland Avenue	Somerville	MA	02143
William Hillier	Southeastern Regional HS	250 Foundry Street	South Easton	MA	02375
Paul Hammond	Worcester Voc Tech HS	2 Grove Street	Worcester	MA	01605

Social Studies Participants

Social Studies	School	Street	City	State	Zip
George Jose	Assabet Valley Regional Voc Tech	Fitchburg Street	Marlboro	MA	01752
Frank J. Longo	Blue Hills Regional Technical HS	800 Randolph Street	Canton	MA	02021
Bob Helms	Cape Cod Regional Technical HS	Pleasant Lake Avenue	Harwich	MA	02645
Roger Dugal	Diman Regional Voc Tech HS	Stonehaven Road	Fall River	MA	02723
Roberg Luongo	Everett Voc Tech HS	121 Pine Street	Everett	MA	02149
Eugene McCarthy	Greater Lowell Regional Voc Tech HS	Pawtucket Boulevard	Tyngsboro	MA	01879
Michael J. Murphy	Greater New Bedford Reg. Voc Tech	1121 Ashley Boulevard	New Bedford	MA	02745
Robert Genova	Medford Voc Tech High School	489 Winthrop Street	Medford	MA	02155
Steven Fernandes	Minuteman Regional Voc Tech HS	758 Marrett Road	Lexington	MA	02173
Michael E. Stoffel	Nashoba Valley Technical HS	100 Littleton Road	Westford	MA	01886
Noreen Mullen	North Shore Regional Voc Tech HS	20 Balch Street	Beverly	MA	01915
Judy Klimkiewicz	Northeast Metropolitan Reg. Voc Tech	Hemlock Road	Wakefield	MA	01880
Terrance Flynn	Northern Berkshire Reg. Voc Tech HS	Hodges Cross Road	North Adams	MA	01247
Gary Brown	Old Colony Regional Voc Tech HS	476 North Avenue	Rochester	MA	02770
Tom Murphy	Shawsheen Valley Technical HS	100 Cook Street	Billerica	MA	01866
William Waslick	Smith Vocational HS	80 Locust Street	Northampton	MA	01060
Ray Zimsky	Tantasqua Regional HS	Brookfield Road	Sturbridge	MA	01566
Barbara Scichilou	Waltham Voc Tech High School	100 Summer Street	Waltham	MA	02154
Paul Donovan	Westfield Voc Tech High School	33 Smith Avenue	Westfield	MA	01086
Katherine E. Green	Worcester D. Fanning Trade School	24 Chatham Street	Worcester	MA	01608

Other Participants

Other	School	Street	City	State	Zip
Arthur Duggan	Assabet Valley Reg. Voc Tech	Fitchburg Street	Marlboro	MA	01752
John Festa	Blackstone Valley Regional Voc Tech	Pleasant Street	Upton	MA	01568
John T. Lucas	Blue Hills Regional Technical HS	800 Randolph Street	Canton	MA	02021
Joseph Hart	Brockton HS	470 Forest Avenue	Brockton	MA	02401
William McCarthy	Cape Cod Regional Technical HS	Pleasant Lake Avenue	Harwich	MA	02645
Bill Burns	Greater Lowell Regional Voc Tech HS	Pawtucket Boulevard	Tyngsboro	MA	01879
Nancy Paglari	King Philip Regional Voc Tech HS	201 Franklin Street	Wrentham	MA	02093
Robert DeVincentis	Leominster High School	122 Granite Street	Leominster	MA	01453
John Pilla	Milford HS	31 West Fountain Street	Milford	MA	01757
Bill Blake	Minuteman Regional Voc Tech HS	758 Marrett Road	Lexington	MA	02173
Bob Peach	Montachusett Regional voc Tech HS	1050 Westminster Street	Fitchburg	MA	01420
Charles Valera	Nashoba Valley Technical HS	100 Littleton Road	Westford	MA	01886
Patrick Crozier	Quincy Voc Tech HS	107 Woodward Avenue	Quincy	MA	0216
Phil Bergstrom	Rindge Technical School	459 Broadway Street	Cambridge	MA	02138
John Judge	Shawsheen Valley Technical HS	100 Cook Street	Billerica	MA	01866
Peter Aladjem	Somerville Voc Tech HS	81 Highland Avenue	Somerville	MA	02143
Marsha McDonaugh	Waltham Voc Tech HS	100 Summer Street	Waltham	MA	02154
Mary Urban	Worcester D. Fanning Trade School	24 Chatham Street	Worcester	MA	01608

APPENDIX C

AGENDAS FOR PROJECT RESEARCH ACTIVITIES

PROJECT ACTIVITY MATRIX

Task #	Objectives	Activity	Staff Responsible	Time Table
#1	A2	Examine sample academic teacher and student resource guides developed via Texas Educational Personnel Development Consortium	Project Director	June 1988
#2	A2	Initiate preliminary ERIG search to identify potential print and non-print resources	" "	June 1988
#3	A1 & A3	Meet with staff from Division of Occupational Bureau of Program Services to coordinate project design and development	" "	June 1988
#4	A5	Confirm institutional commitment with WSC President, Vice President and Co-Director for Occupational Education	" "	July-July 1988
#5	A2	Obtain and review National Evaluation System Cnf. publications on "Assessing Basic Skills in Higher Education in New Orleans"	" "	July-August
#6	A2	Gather and obtain CBE materials from National Center for Research in Vocational Education	" "	July-August
#7	A2	Review and analyze Coordinated Vocational Academic Education materials developed by Occupational Curriculum Laboratory of East Texas State University	" "	July-August
#8	A2	Obtain and examine the math, science and civics materials designed for vocational technical programs via Dr. Frederick Welch and the staff of Pennsylvania State Univ.	" "	August-Sept.
#9	A2 & A3	Contact the project coordinators of School/College Mathematics Transition Project to identify potential areas of collaboration	" "	Sept.-Oct.
#10	A2	Examine and evaluate the occupationally related academic curriculum materials designed by staff of the New York Technical Mathematics Project	" "	Sept.-Oct.
#11	A3 & A4	Initiate coordinated planning effort with key personnel of the Division's Model Competency-Based Technical Assistance Project, Model Math/Science Competency Based Project and Model Communications Project to design project workshops and project survey instruments and recommendations	Project director	Sept.-Oct.
#12	A4 & A5	Design and promote participation in three project mini workshops	" "	Oct.-Nov.
#13	A1, A2, A3, A4 & A5	Meet with project advisory committee	" "	Aug.-July (six meetings)

Task #	Objectives	Activity	Staff Responsible	Time Table
#14	A2	Collect information on current academic support practices, trends and offerings within Massachusetts	Project Director, Advisory Committee	Sept.-Dec. voc. tech. school & Contact Ntwrk
#15	A5	Design, promote and coordinate two major statewide conferences	Project Director & Advisory Committee	Jan.-Feb.
#16	A3 & A5	Participate in various activities established by professional vocational technical organizations to disseminate project concept and findings	Project Director	Aug.-June
#17	A4 & A5	Develop informational video tape presentation	Project Director & outside firm	March-June
#18	A4 & A5	Design project descriptive booklet	Project Director & printer	March-June
#19	A3, A4, A5	Present summary report at 1989 Annual Professional	Project Director & Development Conference	June-July
#20	A4	Work collectively with Massachusetts Basic Skills testing groups and appropriate Division of Occupational Education staff to develop curricular testing strategies in keeping with statewide testing procedures	" "	May-June
#21	A4	Review all project designed materials to insure the elimination of sex/race stereotyping and discrimination	Project Director, Advisory Committee & Task Force	Aug.-June

WELCOME
to the
FIRST OF
TWO MAJOR CONFERENCES
FOR A
MODEL ACADEMIC CURRICULUM
in a
VOCATIONAL - TECHNICAL
SETTING

> "As I talk to education leaders, both here and throughout the country, I become convinced that we are close to a fundamental rethinking of the way teaching works in america. We are ready to build on the tough standards we have created in the past three years. With an expanded pool of talented teachers, we can explore ways to empower teachers to do their job better. We can get teachers more involved in professional decisions within the school. We can help teachers better share their talents and knowledge with their colleagues."

Governor Thomas H. Kean
New Jersey

This conference will draw upon the ideas, energy and commitment of representatives from the sixty-one school systems providing vocational technical programs with the Commonwealth of Massachusetts.

AGENDA

9:30 - 10:00	Coffee and Registration	
10:00 - 10:45	Welcoming Remarks	William J. Collins Superintendent-Director Greater Lowell Regional
	Introductory Remark	David F. Cronin Associate Commissioner Div. of Occupational Education
	The Project's Concept and Potential	Elaine Cadigan Director of Program Services Div. of Occupational Education
	Learning Style A Refresher	Ronald Fitzgerald Superintendent-Director Minuteman Regional Vocational
10:45 - 11:30	Assigned Academic Cluster Workshops	
11:30 - 12:30	Complimentary Lunch	
12:30 - 3:00	Assigned Academic Cluster Workshops	
3:00 - 4:00	Group Summations	

PROJECT ADVISORY COMMITTEE

Teresa Bellini - N. Berkshire Reg. Voc. Tech. H.S.
Tomasa Couverthier - Boston Public Schools
Harvey Evans - MA Rehabilitation Commission
Cynthia Fiducia - Greater Lawrence Reg. Voc. Tech. H.S.
Jeff Johnston - Quincy Voc. Tech. H.S.
Ray Larivee - Cape Cod Reg. Voc. Tech. H.S.
Leslie Lesperance - S. Middlesex Reg. Voc. Tech. H.S.
Frank Longo - Blue Hills Regional Voc. Tech. H.S.
Richard Marchand - Greater Lowell Reg.Voc. Tech.H.S.
Marsha McDonough - Waltham Voc. Tech. H.S.
John Nevins - Westfield State College
Patricia Siddall - Bay Path Reg. Voc. H.S.
Mary Urban - Fanning Trade H.S.

This project was made possible via funds provided by The Division of Occupational Education Massachusetts Department of Education.

Dr. David F. Cronin *Associate Commissioner*	Dr. Elaine Cadigan, Director *Bureau of Program Services*	Dr. Michael Fitzpatrick, Project Director *Westfield State College*

This project was endorsed by The Board of Trustees of Westfield State College on September 12, 1988

BEST COPY AVAILABLE

MATH CLUSTER

Meeting Room - Lecture Hall
Facilitator - Bill Mahoney
Resource Person - Ann Marie Buczek

> *"At a time when economic growth is increasingly dependent on mastery of science and technology, U.S. eighth graders' knowledge and understanding of mathematics is below that of most of their counterparts in other industrialized countries."*
>
> Educational Testing Service
> 1985

AGENDA

Objective	Activity
#1 - Data collection	#1 - Appoint a recorder who will compile summarized notes of the subcommittee's deliberations.
#2 - Identification of optimal curricular content	#2 - By grade, identify the titles of all math course offerings which, in the group's professional judgment, should be included in a model academic curriculum for a vocational technical high school.
#3 - Familiarization of statewide and other resources and products	#3 - Examine and discuss resources and materials provided via sample statement projects and identify suggested resources which should be taken into consideration in designing a model curriculum for your subject area.
#4 - Sharing of model strategies	#4 - Share current curricular practices of your subject area and summarize strategies (either proposed or in place) which address(ed) academic improvement within your school system.
#5 - Provision of project planners may	#5 - The follow-up meetings will focus upon input to defining the parameters, flushing out curricular contents and prioritizing the courses selected in Task #2. The group also propose other future agenda tasks and concerns as appropriate.
#6 - Conference-wide informational sharing	#6 - At approximately 3 p.m. the large group will reconvene and brief cluster group summations will be shares.

SCIENCE CLUSTER

Meeting Room - Math-Science Media Center
Facilitator - Dennis Murphy
Resource Persons - Dick Marchand
Ray Larivee
John Roper

> *"As we debate public policies to stimulate economic growth and regain our economic strength, we ought to remember that our public schools are a stronger economic weapon than any monetary theory, trade policy or book on Japanese management. Education generally - the public school in particular - is the most basic source of long-term american productivity and economic well-being"*
>
> Governor Bruce Babbit
> Arizona

AGENDA

Objective	Activity
#1 - Data collection	#1 - Appoint a recorder who will compile summarized notes of the subcommittee's deliberations.
#2 - Identification of optimal curricular content	#2 - By grade, identify the titles of all science course offerings which, in the group's professional judgment, should be included in a model academic curriculum for a vocational technical high school.
#3 - Familiarization of statewide and other resources and products	#3 - Examine and discuss resources and materials provided via sample statewide projects and identify suggested resources which should be taken into consideration in designing a model curriculum for your subject area.
#4 - Sharing of state model strategies	#4 - Share current curricular practices of your subject area and summarize strategies (either proposed or in place) which address(ed) academic improvement within your school system.
#5 - Provision of input project planners	#5 - The follow-up meetings will focus upon defining the parameters, flushing out to curricular contents and prioritizing the courses selected in Task #2. The group may also propose other future agenda tasks and concerns as appropriate.
#6 - Conference-wide informational sharing	#6 - At approximately 3 p.m. the large group will reconvene and brief cluster group summations will be shares.

ENGLISH COMMUNICATION

Meeting Room - Business Satellite Media Center
Facilitator — Cynthia Fiducia
Resource Person - Frank Longo

> *“Adam Smith, in The Wealth of Nations, in 1776 pointed out that the wealth of nations was very much determined by the quality of its work force. Human resources provide the basis of productivity and productivity growth... Without a literate, skilled, healthy, and motivated labor force, capital and technology cannot create a productive environment.”*

Productivity Growth: A Better Life for America,
A Report to the President of the United States,
White House Conference on Productivity, 1984

AGENDA

Objective	Activity
#1 - Data collection deliberations.	#1 - Appoint a recorder who will compile summarized notes of the subcommittee's
#2 - Identification of optimal curricular content	#2 - By grade, identify the titles of all English Communications course offerings which, in the group's professional judgement, should be included in a model academic curriculum for a vocational technical high school.
#3 - Familiarization of statewide and other resources and products	#3 - Examine and discuss resources and materials provided via sample statewide projects and identify suggested resources which should be taken into consideration in designing a model curriculum for your subject area.
#4 - Sharing of model strategies	#4 - Share current curricular practices of your subject area and summarize strategies (either proposed or in place) which address(ed) academic improvement within your school system
#5 - Provision of input to project planners	#5 -The follow-up meetings will focus upon defining the parameters, flushing out curricular contents and prioritizing the courses selected in Task #2. The group may also propose other future agenda tasks and concerns as appropriate.
#6 - Conference-wide informational sharing	#6 - At approximately 3 p.m. the large group will reconvene and brief cluster group summations will be shared.

SOCIAL STUDIES CLUSTERS

Meeting Room _ Guidance Conference Room
Facilitators - Richard Sinkoski
Bill Paquette
Resource Person—Gary Murphy

> ***"The most fundamental requirement for a democracy is an educated citizenry capable of informed judgment on public issues. Participation in self-governance will require a higher standard of scientific literacy, a deeper understanding of history, and a greater capacity to think critically."***

Who Will Teach Our Children? A Strategy for Improving California's Schools, The Report of the California Commission on the Teaching Profession, 1985

AGENDA

Objective	Activity
#1 - Data collection deliberations.	#1 - Appoint a recorder who will compile summarized notes of the subcommittee's
#2 - Identification of optimal curricular	#2 - By grade, identify the titles of all social studies course offerings which, in the group's professional judgement, should be included in a model academic curriculum for a vocational technical high school.
#3 - Familiarization of statewide and other resources and products	#3 - Examine and discuss resources and materials provided via sample statewide projects and identify suggested resources which should be taken into consideration in designing a model curriculum for your subject area.
#4 - Sharing of model strategies	#4 - Share current curricular practices of the art of your subject area and summarize strategies (either proposed or in place) which address(ed) academic improvement within your school system.
#5 - Provision of input to project planners	#5 The follow-up meetings will focus upon defining the parameters, flushing out curricular contents and prioritizing the courses selected in Task 2. The group may also propose other future agenda tasks and concerns as appropriate.
#6 - Conference-wide informational sharing	#6 - At approximately 3 p.m. the large group will reconvene and brief cluster group summations will be shared.

OTHER ACADEMIC OFFERINGS

Meeting Room - TBA
Facilitator - Shelia Herbert
Resource Persons - Bill Burns
Anne Marie McDonald
Susanne Cantone

"If only to keep and improve on the slim competitive edge we still retain in world markets, we must dedicate ourselves to the reform of our educational system..."

A Nation at Risk, The National Commission on Excellence in Education, 1983

"...it is our judgment that a high general level of education is perhaps the most important key to economic growth."

Action for Excellence, Task Force on Education Commission of the States, 1983

AGENDA

Objective	Activity
#1 - Data collection	#1 - Appoint a recorder who will compile summarized notes of the subcommittee's deliberations.
#2 - Identification of optimal curricular content	#2 - By grade, identify the titles of all other academic course offerings which, in the group's professional judgement, should be included in a model academic curriculum for a vocational technical high school.
#3 - Familiarization of statewide and other resources and products	#3 - Examine and discuss resources and materials provided via sample statewide projects and identify suggested resources which should be taken into consideration in designing a model curriculum for your subject area.
#4 - Sharing of model strategies	#4 - Share current curricular practices of your subject area and summarize strategies (either proposed or in place) which address(ed) academic improvement within your school system.
#5 - Provision of input to project planners	#5 The follow-up meetings will focus upon defining the parameters, flushing out curricular contents and prioritizing the courses selected in Task 2. The group may also propose other future agenda tasks and concerns as appropriate.
#6 - Conference-wide informational sharing	#6 - At approximately 3 p.m. the large group will reconvene and brief cluster group summations will be shared.

March 22,1989

To: Model Academic Project Cluster Coordinators
From: Michael Fitzpatrick
Re: Core Group Meetings

Our early January planning session at Nashoba Valley RVTHS identified several follow-up strategies for refining and consolidating the specific recommendations for each academic cluster. You may recall that the primary course of action encouraged cluster coordinators to identify a small working group from those who participated in workshops and then to finalize a proposed pattern of courses and/or integrated learning activities specific to the given cluster. Coordinators indicated a need for participant enrollment lists and that information was disseminated.

Project requirements call for the cluster recommendations to be shared with colleagues during the Annual Professional Development Conference scheduled for June 26-29th. It would therefore be particularly helpful if you would convene your core working group to provide a product consistent with that schedule.

Thank you again for your invaluable assistance.

Michael Fitzpatrick

Enclosure: sample letter from Math Cluster

Memorandum

To: Model Academic Cluster Coordinators
From: Michael Fitzpatrick
Regarding: Planning Data

The following tasks were developed for the 4/5/89 Blackstone Valley Regional meeting of the six member math cluster core group. The information may be helpful to you as you shape final cluster recommendations:

* Analyze previous cluster deliberations and reports and modify to reflect specific course and/or learning activity patterns.

* Examine final recommendations In relationship to statewide curriculum efforts (CBE, MSCP, Applied Math/Science, etc..)

* Review your cluster model versus current school system practices (ex. percentage of time devoted to discipline in each, etc..)

* Identify strategies, resources, leads for strengthening the delivery of your model and improving instruction within your cluster (ex. simulation exercises, gaming devices, etc..)

* Comment on how you would integrate additional opportunities to promote your discipline within vocational technical or other academic school learning environments.

* If staff in service is an implementation component for your model, describe the type and characteristics of such.

* Explain procedures for enhancing your discipline via outside classroom settings (extracurricular activities, summer camps. etc..)

Where does homework fit In with the recommendations of your cluster model?

How would your model blend with a centralized computer literacy laboratory which would provide students with an opportunity to utilize microcomputer skills to complete various academic assignments?

A MODEL TO GUIDE AND DESIGN THE ACADEMIC CURRICULUM DELIVERY SYSTEM IN VOCATIONAL-TECHNICAL EDUCATION SCHOOLS AND PROGRAMS

-- EXECUTIVE BRIEFING --

PROFESSIONAL DEVELOPMENT CONFERENCE FOR
VOCATIONAL-TECHNICAL EDUCATION

WESTFIELD STATE COLLEGE
WESTFIELD, MASSACHUSETTS
JUNE 26 - 29, 1989

MASSACHUSETTS DEPARTMENT OF EDUCATION
DIVISION OF OCCUPATIONAL EDUCATION

"A MODEL ACADEMIC CURRICULUM PROJECT"

PURPOSE

TO ASSESS AND DEFINE THE MOST EFFECTIVE COMPONENTS OF A MODEL ACADEMIC CURRICULUM FOR VOCATIONAL-TECHNICAL SCHOOLS THAT REFLECT THE ACADEMIC DEMANDS AND EMPLOYMENT NEEDS OF A DIVERSIFIED AND HIGHLY SOPHISTICATED TECHNOLOGICAL SOCIETY.

MASSACHUSETTS DEPARTMENT OF EDUCATION
DIVISION OF OCCUPATIONAL EDUCATION

"A MODEL ACADEMIC CURRICULUM PROJECT"

GOALS:

1. CONDUCT A STATEWIDE ASSESSMENT OF THE ACADEMIC CURRICULUM IN THE VOCATIONAL-TECHNICAL SETTING
2. REVITALIZE THE ACADEMIC CURRICULUM WITHIN VOCATIONAL-TECHNICAL SCHOOLS BY PROVIDING RECOMMENDATIONS AND FRAMEWORKS FOR CURRICULUM COMPONENTS THAT DIRECTLY MEET THE NEEDS OF TODAY'S VOCATIONAL-TECHNICAL STUDENTS
3. DESIGN CURRICULUM COMPONENTS WHICH INCLUDE INNOVATIVE METHODOLOGICAL MODIFICATIONS FOR MORE EFFECTIVE INTEGRATION OF ACADEMIC AND TECHNICAL CONCEPTS
4. STRENGTHEN THE PARTICIPATION AND SUCCESS OF ALL STUDENTS IN THE ACADEMIC PROGRAMS WITHIN VOCATIONAL/TECHNICAL EDUCATION -- ESPECIALLY AT-RISK STUDENTS AND NON-TRADITIONAL STUDENTS
5. ESTABLISH A SYSTEM OF CURRICULUM ASSESSMENT, CURRICULUM DEVELOPMENT, AND INSTRUCTIONAL MANAGEMENT FOR THE IMPROVED DELIVERY OF THE ACADEMIC CURRICULUM

MASSACHUSETTS DEPARTMENT OF EDUCATION
DIVISION OF OCCUPATIONAL EDUCATION

"A MODEL ACADEMIC CURRICULUM PROJECT"

STRATEGY:

AS THE DEFINITION OF LEARNER COMPETENCIES EXTENDS BEYOND THE KNOWLEDGE OF SIMPLE SKILL LEVELS, THE MATTER OF ACADEMIC AND TECHNICAL CURRICULUM DELIVERY IS BECOMING INCREASINGLY COMPLEX. AS A RESULT, IT WILL DEMAND MORE ARTICULATION AND ALIGNMENT OF THE ACADEMIC AND TECHNICAL CURRICULUM

MASSACHUSETTS DEPARTMENT OF EDUCATION
DIVISION OF OCCUPATIONAL EDUCATION

"A MODEL ACADEMIC CURRICULUM PROJECT"

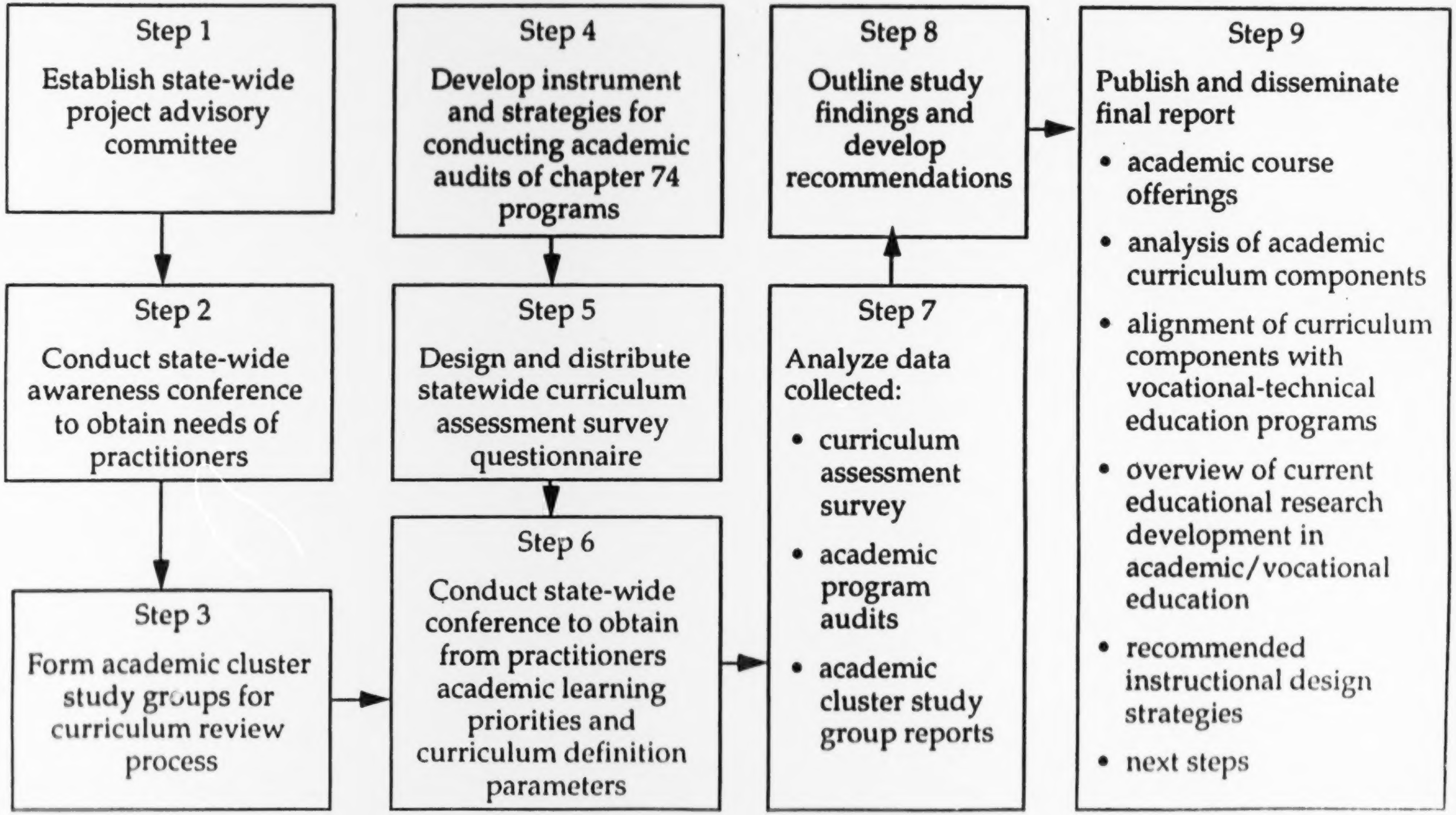
"WINNING THE GLOBAL COMPETITION FOR JOBS REQUIRES US TO RETOOL OUR SCHOOLS JUST AS WE ARE RETOOLING OUR INDUSTRIES"

ROBERT G. ORR
GOVERNOR - INDIANA

MASSACHUSETTS DEPARTMENT OF EDUCATION

"REGIONAL TECHNICAL/ACADEMIC ASSESSMENT CENTERS"

ASSESSMENT AND DESIGN OF MODEL ACADEMIC CURRICULUM PROJECT



Step 1

Establish state-wide project advisory committee

Step 2

Conduct state-wide awareness conference to obtain needs of practitioners

Step 3

Form academic cluster study groups for curriculum review process

Step 4

Develop instrument and strategies for conducting academic audits of chapter 74 programs

Step 5

Design and distribute statewide curriculum assessment survey questionnaire

Step 6

Conduct state-wide conference to obtain from practitioners academic learning priorities and curriculum definition parameters

Step 7

Analyze data collected:

- curriculum assessment survey
- academic program audits
- academic cluster study group reports

Step 8

Outline study findings and develop recommendations

Step 9

Publish and disseminate final report

- academic course offerings
- analysis of academic curriculum components
- alignment of curriculum components with vocational-technical education programs
- overview of current educational research development in academic/vocational education
- recommended instructional design strategies
- next steps

MASSACHUSETTS DEPARTMENT OF EDUCATION
DIVISION OF OCCUPATIONAL EDUCATION

"A MODEL ACADEMIC CURRICULUM PROJECT"

STUDY COMPONENTS:

A. STATE-WIDE ORIENTATION MEETINGS

B. IDENTIFICATION/SELECTION OF ACADEMIC CLUSTER STUDY GROUPS

C. ACADEMIC STUDY REPORTS - MATH, SCIENCE, ENGLISH, SOCIAL STUDIES

D. STATE-WIDE ASSESSMENT SURVEY OF ACADEMIC CURRICULUM

E. PUBLICATION OF FINAL REPORT -- FINDINGS AND RECOMMENDATIONS

MASSACHUSETTS DEPARTMENT OF EDUCATION
DIVISION OF OCCUPATIONAL EDUCATION

"A MODEL ACADEMIC CURRICULUM PROJECT"

THE CHALLENGE:

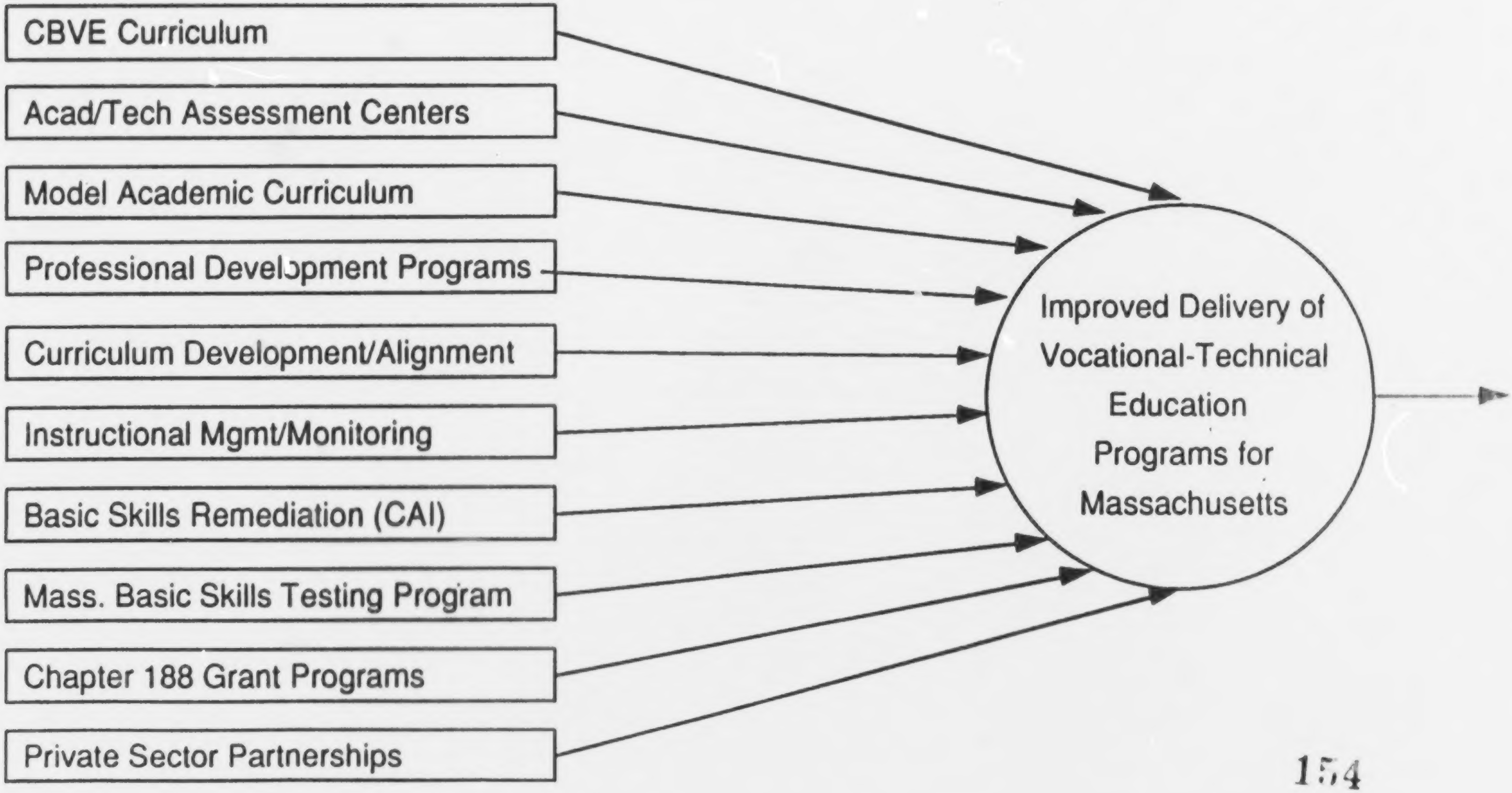
DESIGNING AND DEVELOPING A MODEL ACADEMIC CURRICULUM THAT MEETS THE DEMANDS OF THE COMPETENCY-BASED VOCATIONAL EDUCATION CURRICULUM IS IMPORTANT.

INTEGRATING SUCH A SYSTEM WITH VOCATIONAL-ACADEMIC INSTRUCTION IS CRITICAL!

MASSACHUSETTS DEPARTMENT OF EDUCATION
DIVISION OF OCCUPATIONAL EDUCATION

"A MODEL ACADEMIC CURRICULUM PROJECT"

"Integration of Programs, Services, and R+D Activities"



CBVE Curriculum

Acad/Tech Assessment Centers

Model Academic Curriculum

Professional Development Programs

Curriculum Development/Alignment

Instructional Mgmt/Monitoring

Basic Skills Remediation (CAI)

Mass. Basic Skills Testing Program

Chapter 188 Grant Programs

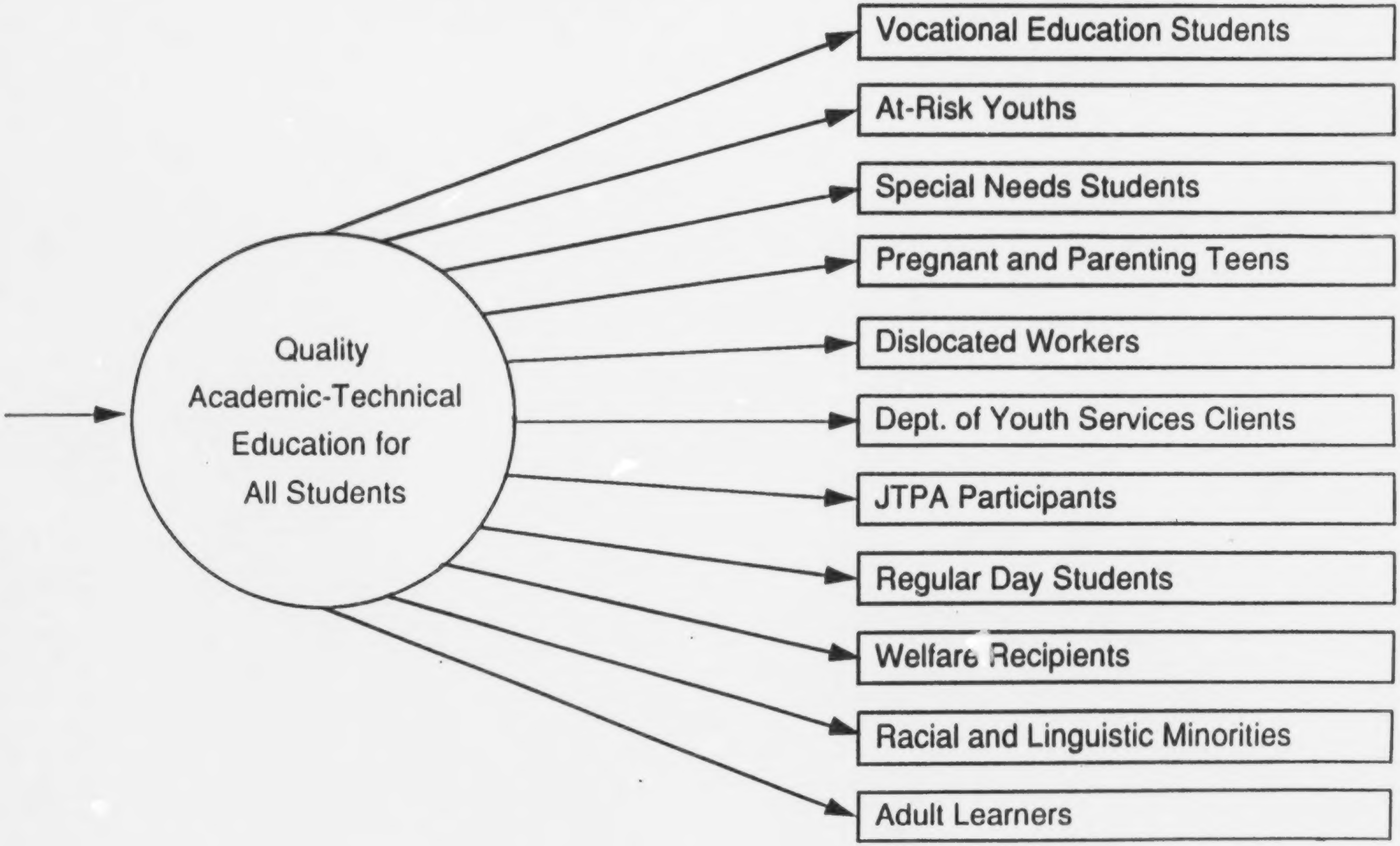
Private Sector Partnerships

Improved Delivery of Vocational-Technical Education Programs for Massachusetts

MASSACHUSETTS DEPARTMENT OF EDUCATION
DIVISION OF OCCUPATIONAL EDUCATION

"A MODEL ACADEMIC CURRICULUM PROJECT"

". . . Results in a Comprehensive Educational Delivery System"



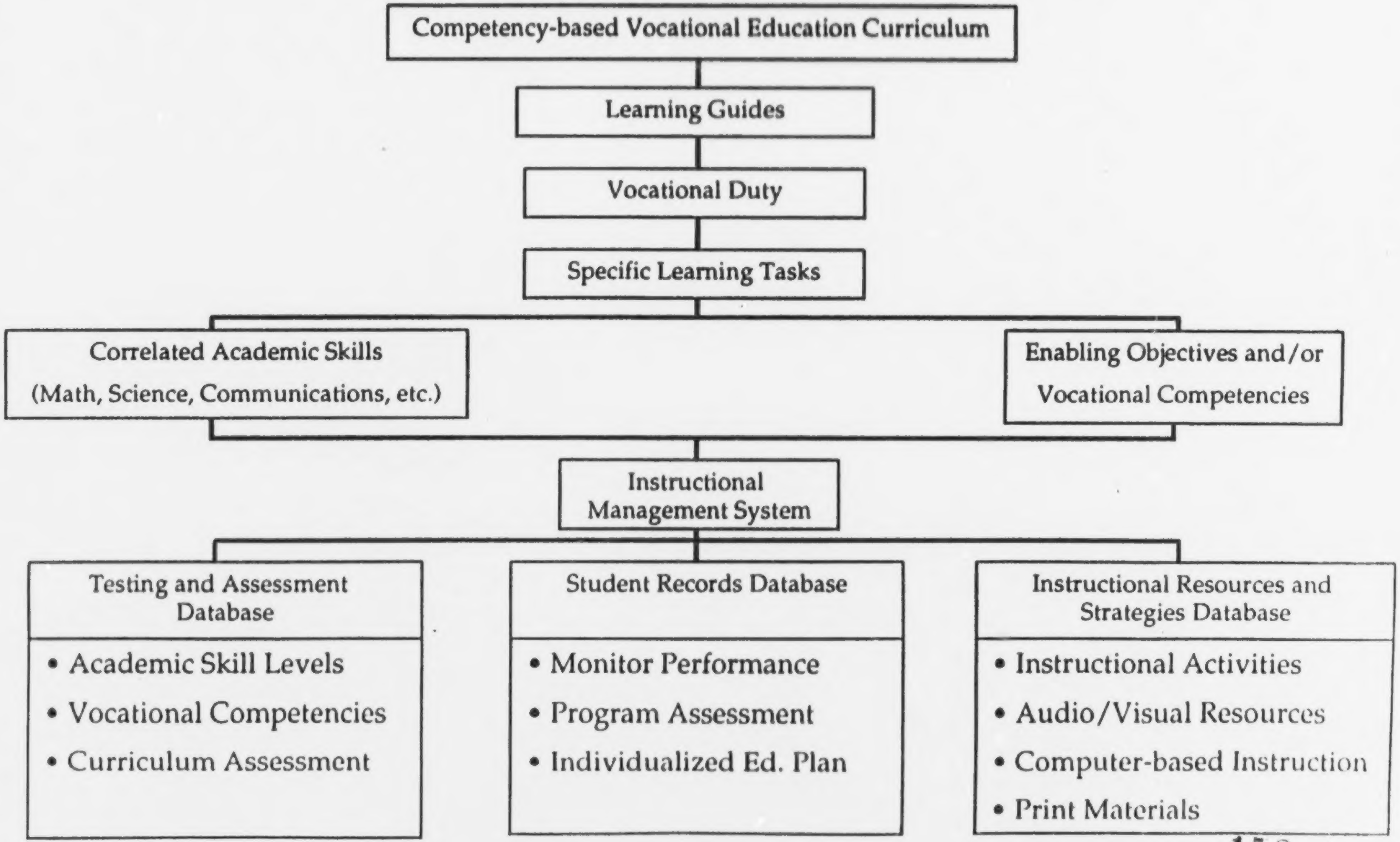
Quality Academic-Technical Education for All Students

- Vocational Education Students
- At-Risk Youths
- Special Needs Students
- Pregnant and Parenting Teens
- Dislocated Workers
- Dept. of Youth Services Clients
- JTPA Participants
- Regular Day Students
- Welfare Recipients
- Racial and Linguistic Minorities
- Adult Learners

MASSACHUSETTS DEPARTMENT OF EDUCATION
DIVISION OF OCCUPATIONAL EDUCATION

"A MODEL ACADEMIC CURRICULUM PROJECT"

A Computerized Instructional Management System for CBVE and the Model Academic Curriculum



Competency-based Vocational Education Curriculum

Learning Guides

Vocational Duty

Specific Learning Tasks

Correlated Academic Skills (Math, Science, Communications, etc.)

Enabling Objectives and/or Vocational Competencies

Instructional Management System

Testing and Assessment Database
- Academic Skill Levels
- Vocational Competencies
- Curriculum Assessment

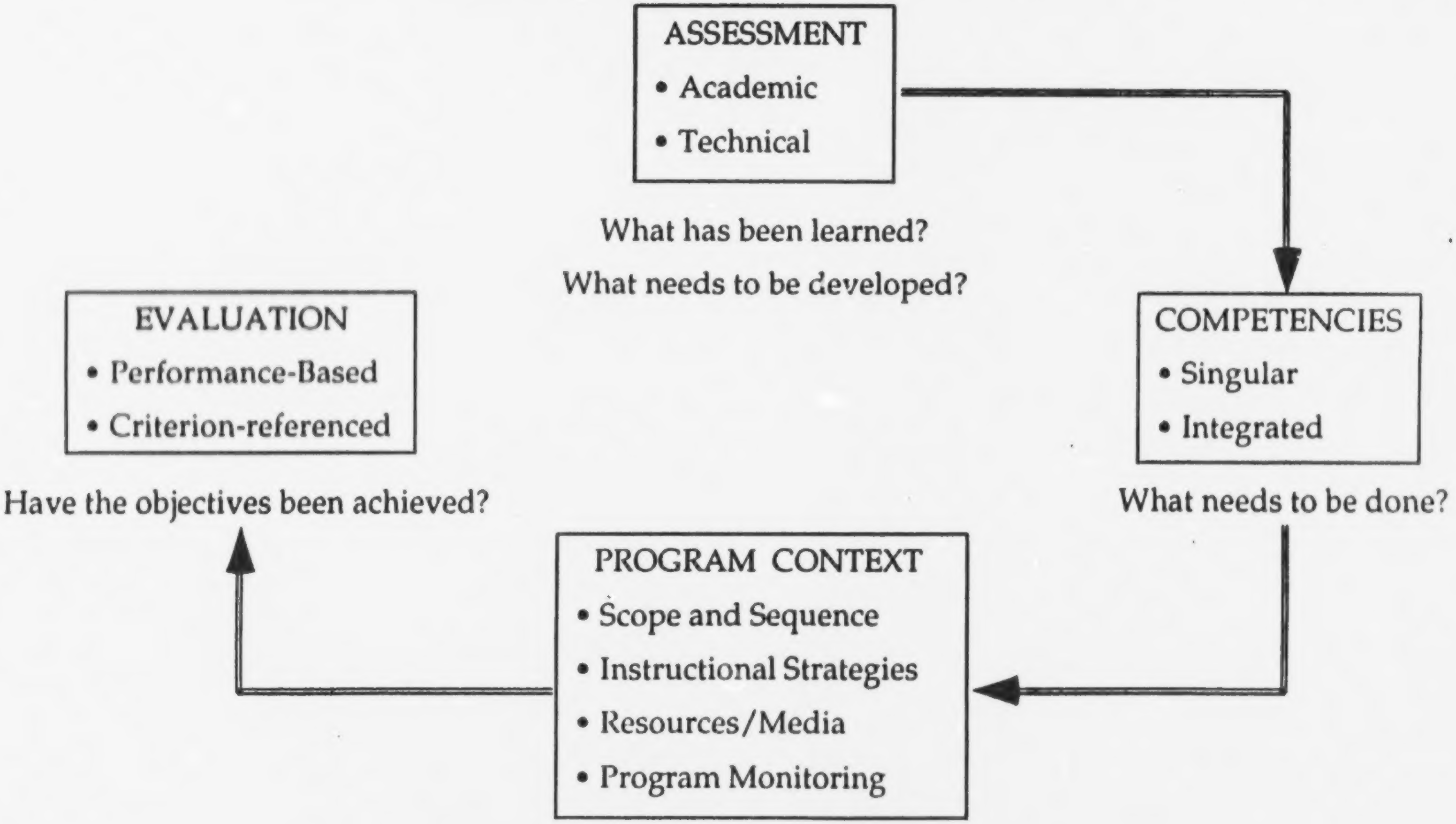
Student Records Database
- Monitor Performance
- Program Assessment
- Individualized Ed. Plan

Instructional Resources and Strategies Database
- Instructional Activities
- Audio/Visual Resources
- Computer-based Instruction
- Print Materials

MASSACHUSETTS DEPARTMENT OF EDUCATION
DIVISION OF OCCUPATIONAL EDUCATION

"A MODEL ACADEMIC CURRICULUM PROJECT"

Model Academic Curriculum Delivery System



ASSESSMENT
- Academic
- Technical

What has been learned?

What needs to be developed?

COMPETENCIES
- Singular
- Integrated

What needs to be done?

PROGRAM CONTEXT
- Scope and Sequence
- Instructional Strategies
- Resources/Media
- Program Monitoring

EVALUATION
- Performance-Based
- Criterion-referenced

Have the objectives been achieved?

Competency-Based Education Cycle

MASSACHUSETTS DEPARTMENT OF EDUCATION
DIVISION OF OCCUPATIONAL EDUCATION

"A MODEL ACADEMIC CURRICULUM PROJECT"

OUTCOMES/BENEFITS:

- NEW PROCESSES FOR IMPROVING SCHOOL PERFORMANCE BY ENSURING THAT ALL ELEMENTS OF A SCHOOL'S ACADEMIC CURRICULUM -- ITS ASSESSMENTS, LEARNING TASKS, REMEDIAL PROGRAMS AND INSTRUCTIONAL MATERIALS -- ARE ALL CAREFULLY ALIGNED WITH RELATED VOCATIONAL-TECHNICAL COMPETENCIES
- PROVIDES FOR MORE EFFECTIVE INSTRUCTION BY MAKING MORE PERTINENT STUDENT-CENTERED CURRICULUM INFORMATION AVAILABLE TO THE TEACHER
- FACILITATES THE IMPLEMENTATION OF AN INSTRUCTIONAL DELIVERY SYSTEM THAT FOCUSES ON DIFFERENCES IN LEARNING -- NOT IN LEARNERS
- PROMOTES INCREASED MOTIVATION OF STUDENTS FOR LEARNING, EFFECTIVENESS OF INSTRUCTIONAL PROGRAMS, AND VALIDITY OF ACADEMICS WITHIN A MORE MEANINGFUL CONTEXT
- IMPROVES COMMUNICATION BETWEEN ACADEMIC AND VOCATIONAL-TECHNICAL INSTRUCTORS (CURRICULUM ARTICULATION)

APPENDIX D

SAMPLE ACADEMIC PROGRAM INSTRUMENTS

SAMPLE #1
VOCATIONAL ACADEMIC EVALUATION INTERVIEW INSTRUMENT

1. Does the school system have a philosophical mission statement to coordinate the academic and vocational programs? If so, please describe its general intent.

2. What advanced academic courses do Chapter 74 vocational students participate in? Are there gifted and talented programs? Please specify.

3. How are academic competencies determined for vocational students?

4. What specific planning time is set aside and activities undertaken for academic/vocational programs?

    1. English?
    2. Social Studies?
    3. Math?
    4. Science?

5. What guidance policies and activities are in place to coordinate vocational and academic programs?

6. How is shop related instruction usually handled?

7. What could be done to improve the relationship between academic and vocational programming?

8. What in-services exist which permit academic and vocational instructors to meet for purposes of exchange?

9. Are there tutorial or other support assistance for vocational students?

STATEWIDE CURRICULUM PROJECTS

SAMPLE #2
ACADEMIC INSTRUCTORS INTERVIEW INSTRUMENT

Members of the academic faculty can often provide valuable insights regarding the overall integration of vocational education with general education programs. Depending upon the type of school, the integration of academic and vocational courses may vary. So, too, will provisions for cooperative planning and sequencing of students' course work.

When interviewing a member of the academic faculty, the following questions should guide your information gathering activities:

1. How well does the academic program prepare students within technical shop areas requiring a knowledge of math and science?
2. Would you say that academic and vocational programs compliment or compete with one another?
3. To what extent are you involved in cooperative planning with members of the vocational program staff?
4. In your judgement, do students regard the academic portion of their overall curriculum differently than they do the vocational portion? If so, how?
5. In general, do administrative policies, procedure and/or budgetary considerations operate differently for vocational programs as compared to academic programs? If so, how?
6. How would you describe your relationship with members of the vocational program staff?
7. How is the supervision of instructional staff implemented at this school?
8. Does this supervision operate differently for academic instructors as compared to vocational instructors?
9. What do you consider the most immediate problems faced by the school with regard to the delivery of academic instruction to students?
10. What major strengths does the school have for delivering academic instruction to students?
11. If you could make one important change in the school related to your area of responsibility, what would it be?
12. Do you have any other comments regarding the school's overall delivery of academic or vocational education?
13. Is the level of academic courses consistent with technical shop area expectations?
14. Are advanced level academic programs for students with higher education goals available?

APPENDIX E

IN-SERVICE INFORMATION

Massachusetts Curriculum Development Efforts

I. Competency-Based Vocational Education Project: The Massachusetts Model

A. Curriculum Development Projects

1. Vocational Technical Areas

The Division of Occupational Education, in partnership with personnel from vocation technical school districts, have developed CBVE curricula in twenty-five program areas. The major statewide effort was instituted in the spring of 1981.

2. Technology Education

Divisional staff are completing the 7-12 construction Technology cluster and will begin the 7-12 Construction Technology cluster this year.

3. Home Economics

Divisional staff have an RFP out now to begin curriculum development in two home economic clusters: Healthy Life Styles and Parenting/ Child Development.

B. Leadership Project

Greater Lowell has provided the major statewide coordinator for editing, printing and dissemination of CBVE program tasks and duties. Having started with effort in 1983, the state now has 21 completed Math/Science competency curricula. The Math and Science competencies include problem solving and critical thinking skills.

C. Competency-Based Communications Project

This complementary CBVE project identified communication skills for every CBVE program area already developed. The identified communications competencies include language arts, oral and written and critical thinking skills. Massachusetts initiated this project in 1985.

II. Applied Learning Curricula

Massachusetts has joined with other states to develop, field test and disseminate applied academic curricula in the area of communications, mathematics, physics, biology and chemistry.

A. Principles of Technology

This project consists of a two-year curriculum of applied physics and mathematics related to technology. It was developed in 1985 through a consortium of 45 states and two Canadian Provinces. Twenty-six schools are presently implementing this program.

B. Applied Communications

This project was developed by the Agency for Instructional Technology (Bloomington, Indiana) and is presently being field tested at Pathfinder Regional Vocational School.

C. Applied Mathematics

This project was developed by the Center for Occupational Research and Development (Waco, Texas) and is presently being field tested at Upper Cape Cod Technical School.

D. Applied Academic Technical Assistance Project

This project is housed at the University of Massachusetts/Boston to coordinate the field testing and dissemination efforts for the Applied Learning Curricular Projects.

III. Technical/Academic Assessment Centers

These centers are designed to assess, monitor and evaluate the technical/academic competencies of all students enrolled in 9-12 vocational technical programs. There are five assessment centers located in the following schools/regions: (1) Quincy Vocational—Greater Boston Region; (2) Greater Lawrence—Northeast Region; (3) South Middlesex—Central Massachusetts Region; (4) Cape Cod—Southeast Region; and (5) Pathfinder—Greater Springfield Region.

It is indicated that these centers also provide diagnostic/prescription remmediation programs for those other students who scored lower than the state average on the Massachusetts Basic Skills Testing Program. Because the project provides opportunities to strengthen and to improve the participation of all students enrolled in vocational technical programs, especially students at risk, the state is hopeful that it would maximize potentials to attract and to retain students.

IV. Model Academic Curriculum for a Vocational Technical Setting

This project is designed to develop a Model Academic Curriculum which benefits a vocational technical setting, taking all its unique factors into consideration.

A

B

USE NO. 2 PENCIL ONLY

PROPER MARK ●

IMPROPER MARKS ⊙ ◒ ○ ⊗

1. LEA Code

⓪	⓪	⓪	⓪	⓪
①	①	①	①	①
②	②	②	②	②
③	③	③	③	③
④	④	④	④	④
⑤	⑤	⑤	⑤	⑤
⑥	⑥	⑥	⑥	⑥
⑦	⑦	⑦	⑦	⑦
⑧	⑧	⑧	⑧	⑧
⑨	⑨	⑨	⑨	⑨

2. LEA School Name

3. LEA Delivery Type

○ Comprehensive High School
○ Regional/Voc-Tech HS
○ Regional/Acad w/Voc-Tech Programs
○ City/Town Voc-Tech HS
○ County Agricultural School
○ Ind. Trustee Governed Voc-Tech HS

Academic Cluster

☒ Math
○ Science
○ English/Communications
○ Social Studies
○ Other

Subcode

○ ☒ ○
○ ○ ○
○ ○ ○
○ ○ ○
○ ○ ○
○ ○ ○

C Academic Courses Taught to Voc-Tech Students (Please refer to course descriptions listed in directions if not provided in this column.)

D E F G H I J

Course Gender (Male, Female, Balanced)

Course Weight of Credit According to Survey Standard

Vocational Tech Students Enrolled in this course

Course Taking Patterns

1 301 Remedial/Basic Math	Ⓨ – Ⓝ	9 10 11 12	Ⓜ Ⓕ Ⓑ	¼ ½ 1 >1	Ⓨ – Ⓝ	Ⓨ – Ⓝ	○	○	○	○	○
2 302 Practical/General Math	Ⓨ – Ⓝ	9 10 11 12	Ⓜ Ⓕ Ⓑ	¼ ½ 1 >1	Ⓨ – Ⓝ	Ⓨ – Ⓝ	○	○	○	○	○
3 303 Algebra I, Two Year Sequence	Ⓨ – Ⓝ	9 10 11 12	Ⓜ Ⓕ Ⓑ	¼ ½ 1 >1	Ⓨ – Ⓝ	Ⓨ – Ⓝ	○	○	○	○	○
4 304 Algebra I, One Year Sequence	Ⓨ – Ⓝ	9 10 11 12	Ⓜ Ⓕ Ⓑ	¼ ½ 1 >1	Ⓨ – Ⓝ	Ⓨ – Ⓝ	○	○	○	○	○
5 305 Geo try	Ⓨ – Ⓝ	9 10 11 12	Ⓜ Ⓕ Ⓑ	¼ ½ 1 >1	Ⓨ – Ⓝ	Ⓨ – Ⓝ	○	○	○	○	○
6 306 Alg ra I	Ⓨ – Ⓝ	9 10 11 12	Ⓜ Ⓕ Ⓑ	¼ ½ 1 >1	Ⓨ – Ⓝ	Ⓨ – Ⓝ	○	○	○	○	○
7 307 Pre- alcu	Ⓨ – Ⓝ	9 10 11 12	Ⓜ Ⓕ Ⓑ	¼ ½ 1 >1	Ⓨ – Ⓝ	Ⓨ – Ⓝ	○	○	○	○	○
8 308 Trig nom	Ⓨ – Ⓝ	9 10 11 12	Ⓜ Ⓕ Ⓑ	¼ ½ 1 >1	Ⓨ – Ⓝ	Ⓨ – Ⓝ	○	○	○	○	○
9 309 Calc s	Ⓨ – Ⓝ	9 10 11 12	Ⓜ Ⓕ Ⓑ	¼ ½ 1 >1	Ⓨ – Ⓝ	Ⓨ – Ⓝ	○	○	○	○	○
10 310 Business Math	Ⓨ – Ⓝ	9 10 11 12	Ⓜ Ⓕ Ⓑ	¼ ½ 1 >1	Ⓨ – Ⓝ	Ⓨ – Ⓝ	○	○	○	○	○
11 311 Special Topics/Statistics	Ⓨ – Ⓝ	9 10 11 12	Ⓜ Ⓕ Ⓑ	¼ ½ 1 >1	Ⓨ – Ⓝ	Ⓨ – Ⓝ	○	○	○	○	○
12 312 Other Math Courses	Ⓨ – Ⓝ	9 10 11 12	Ⓜ Ⓕ Ⓑ	¼ ½ 1 >1	Ⓨ – Ⓝ	Ⓨ – Ⓝ	○	○	○	○	○
13.	Ⓨ – Ⓝ	9 10 11 12	Ⓜ Ⓕ Ⓑ	¼ ½ 1 >1	Ⓨ – Ⓝ	Ⓨ – Ⓝ	○	○	○	○	○

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APPENDIX G

WESTFIELD STATE COLLEGE
WESTERN AVENUE
WESTFIELD, MA 01085

COURSE NUMBER: ED 300G-03 TITLE: Academic Program Development for Vocational Schools

Course Description:

This course is designed for academic, related theory and shop instructors and/or curriculum coordinators affiliated with the high school instruction of students pursuing a secondary vocational/technical education. The course provides participants from the grant funded Model Academic Project with an opportunity to complete several additional post-project workshop activities and thereby earn three semester hours of graduate or undergraduate credit.

Course Competencies:

Upon successful completion of this course, students will be able to:

1. describe the composition of the academic program of studies available to secondary vocational/technical students within the Commonwealth of Massachusetts.
2. explain and contribute to the design of the structure of a model academic support program for vocational/ technical students.
3. analyze (selected) current issues in relationship to secondary academic support programs.
4. discuss the impact of three or more state wide projects to the existing configuration of academic support within Massachusetts Vocational/Technical Schools.
5. blend extracted educational research into the design and development of a model academic program of schools.

Course Requirements:

Course participants will:

1. actively participate in at least two major project conference workshops, two project regional workshops and the equivalent of two full-day Saturday seminars (40+ contact hours).

APPENDIX H

HOW THE EARLIER REPORTS OF EDUCATIONAL EXCELLENCE DEFINED HIGH SCHOOL GRADUATION REQUIREMENTS

1918 United States Bureau of Education - ***The Cardinal Principles The NEA Commission on the Reorganization of Secondary Education***

Learning should address the following:

- Health
- Command of fundamental processes
- Worthy home membership
- Vocation
- Citizenship
- Worthy use of leisure
- Ethical character

1945 Harvard University's General Education in a Free Society

Common spheres or core - approximately 50% of curriculum

3 Units of English
3 Units of Science
3 Units of Mathematics
2 Units of Social Studies

Electives - approximately 20% of curriculum

1 English Elective
1 Science Elective
1 Mathematics Elective
1 Social Studies Elective

Other Studies with Integrated Math, Language or Other Learning Activities which Promote Common Culture, Citizenship and Standards of Human Good-

approximately 30% of curriculum

Vocational/Business Courses
Work in the Arts
Agriculture
Home Economics
Other Practical Fields

1959 James B. Conant's American High School Today

Common Core

English
Social Studies
Mathematics
Science
Art and Music (with options)
Advanced Work in Academic Subjects for College Bound Studies

Electives in General Education Subjects or Vocational Education